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IRON ORE SHORTAGE.

A PROBLEM THAT HAS BEEN GIVEN SERIOUS CONSIDERATION BY THE BIG INTERESTS IN STEEL AND IRON—DISAPPOINTMENT REGARDING THE MESABI—OPINIONS FROM LEADING REPRESENTATIVES OF THE INDUSTRY.

Unless more great bodies of iron ore are discovered in the mining region of Lake Superior, the iron and steel manufacturing interests of the United States, which are dependent upon that great district for more than 70 per cent. of supplies, will within a few years meet with the serious problem of a shortage of ore. This is not a sensational claim intended to convey the idea that the great iron ore deposits of the lake region will soon be exhausted. It is a statement prompted by the fact that within the past few months especially, the question of a possible shortage in ore supply has been given serious consideration by the largest mining and consuming interests of the country. There is no longer any talk of an inexhaustible supply of ore on any of the Lake Superior ranges. The best evidence of a great change of opinion on this score is the scramble that has been made lately by the big steel and iron combinations—consuming interests—for the purchase of mining properties at double the prices that would be paid for them a year or two ago. In the short period since the Mesabi range was opened, the claims of inexhaustible deposits on that range have been fully disproved and its position as a factor in the situation clearly defined. A geological survey of the Mesabi, made only recently by the Rockefeller interest known as the Consolidated Iron Mines, was followed by the purchase of several large prospects for that interest, which is the largest on the Mesabi. A most convincing argument as to the enormous withdrawal of ore within the past few years from the Lake Superior country is found in the following short summary of figures dealing with the gross ton output in round numbers:

	GROSS TONS
Total output from date of first shipments forty-three years ago	134,000,000
Output during ten years ending with 1898.....	94,000,000
Output during five years ending with 1898.....	55,000,000

What will be the result of the natural increase in this enormous consumption during the next ten years? Furnaces and steel works drawing supplies from the Lake Superior region are today consuming ore at the rate of full 15,000,000 gross tons annually. The above figures show that there was consumed in the past ten years nearly 100 millions out of a total of 134 millions produced during some forty-three years since the first shipment was made.

The Review has sought a few opinions from leading representatives of the ore mining industry on this question of future supply. Mr. L. C. Hanna, president of the Lake Superior Ore Association, and who is the leading spirit in affairs of the firm of M. A. Hanna & Co., holds decided views in the matter. "I think it will be found," he said, "that there is but one opinion among well-informed representatives of producing interests as far as the old ranges are concerned, and that is that we have already in a measure encountered the shortage problem, if the present fifteen-million-ton rate of consumption is to be kept up for any great length of time, and unless new properties are to be found capable of development on a large scale, or a means introduced for using Mesabi ores in greater proportion than they have been used since the opening of that range five or six years ago. It is true that prospects of a higher range of prices have brought on preparations for opening up scores of old mines that could not live under the depression of the past four or five years, but large outputs are not expected from any of these, and what assurance have we that their product will not be offset in the aggregate by depletion in the mines that have been steadily employed? The fact is we are now on a consumption basis as regards old-range ores fully equal, or probably more than equal, to the capacity of producing properties in the districts other than the Mesabi, with the position of that range no longer one of unlimited supply but a definite factor in the situation."

Mr. Samuel Mitchell of Negaunee, Mich., president of the Jackson Iron Co., owning the mine that enjoys the distinction of shipping the first ore from the Lake Superior region, says: "A few years ago, much was written and published about the supply of iron ore on the Lake Superior ranges being inexhaustible, especially the Mesabi. Great damage was done the ore interests by these statements. We do not get reports of this kind from men who know what is meant by taking out so many millions of tons annually and who know of the large hole made in the mine or mines from which such great quantities of ore are taken. Figuring on a basis of only 14,000,000 tons annually for the future, we have 140,000,000 tons in the next ten years, or about 6,000,000 tons more than the total output from all the iron ranges from the date of the first shipment to the close of the 1898 season, and from the present outlook an estimate of 15,000,000 to 20,000,000 tons per annum for the next twenty years will be nearer the consumption than 14,000,000 tons. Taking these facts into consideration, and having some knowledge of the prospects in sight, I feel that there will be a shortage of iron ore inside of ten years, and that many of the now large producing mines will be wrecked within the same period. Iron ore producing properties will be very much in demand in the near future. The Mesabi is, no doubt, a range of great deposits and will figure largely in the

next five years' production. In the meantime this range will, however, be disappointing to many, as regards the quantity of ore that can be produced cheaply. The old Marquette range has produced about 39 per cent. of the total output to date, and its mines are not as deep as those of the newer ranges. This range will, no doubt, continue to be a producer as long as any of them, but I do not know of a mine on it that has twenty years product in sight and I have spent thirty years on the iron ranges and in the mining business."

"I do not think," says James Corrigan of Corrigan, McKinnie & Co., Cleveland, "that the Mesabi range properties will as a whole average 10 per cent. of the tonnage that was estimated for them three or four years ago. This range, repeatedly pronounced inexhaustible, has proven very disappointing. Nearly every property was counted on to produce millions of tons but many of them that were thought to have such quantities of ore have been well used up after producing 100,000 tons."

Mr. W. G. Mather of the Cleveland-Cliffs Iron Co. said that he had not of late given any especial study to the ore resources of ranges other than the Marquette range, but in a general way he would be surprised if the present rate of production from the Lake Superior region could not be kept up for fifty years.

It was hoped that an opinion on the subject could be secured from Mr. Henry W. Oliver of the Oliver Iron Mining Co., who has been instigative in causing the Carnegie Steel Co. to undertake, within the past few years, the control of mines capable of producing about 4,500,000 tons of ore annually, but Mr. Oliver's answer was: "I regret that I cannot comply with your request, as I do not deem it wise, with the position I occupy regarding ore interests, to take any except my associates into my confidence. I am sorry I cannot favor the Review, as you give accurate and valuable information regarding Northwestern ore and shipping interests."

LAKE FREIGHT SITUATION—INSURANCE MATTERS.

Aside from the announcement of two season contracts for the movement of coal to Lake Superior, there is little of special interest in the freight situation. Capt. James Davidson of West Bay City some time ago took a large quantity of coal to be moved to the head of the lakes throughout the season at 30 cents. There is more coal to be had at that figure but little disposition on the part of vessel owners to take it. A small block of coal to go to Portage was also taken some time ago. The rate was 35 cents, which, as in the case of the coal to go to the head of the lakes, is the going rate on wild charters. In view of the late opening and general prospects of a profitable season, vessel owners are still of the opinion that they had better take chances on wild rates than enter into further contracts at rates that might be had for season engagements. The contract rate of 50 cents has been paid thus far on all single-trip charters for the movement of ore from Escanaba, with no surplus of vessels, and it is more than probable that the Lake Superior contract rate—60 cents—will also prevail in the first charters from the head of the lakes, unless a sudden change occurs in the grain situation at Duluth.

As far as can be learned, there is no back-down on the part of the insurance companies regarding the high tariff of rates announced several days ago. Owners having large fleets of the best class of steel and wooden vessels that found insurance direct in London through Chicago brokerage sources managed to get much better rates and more favorable policies than are provided in the tariff of the so-called old line lake companies. The difference in the foreign policy for steel vessels as compared with last year is not of great importance. There is full collision, except with docks and other stationary objects, but the deductible average is one-half of 1 per cent, against a quarter of 1 per cent last year. On wooden vessels the one-third off new for old feature prevails in the foreign insurance as well as in the home tariff. But the rates made by the foreigners on business which they have accepted are materially lower than can be secured from the home companies. A few cases are noted where steel steamers were placed a little lower than 4¼ per cent, steel barges and wooden steamers at 5 per cent, and wooden barges at 6 per cent.

AMERICAN SHIP BUILDING COMPANY.

Senator Hanna of Ohio is the largest owner of stock in the new American Ship Building Co., representing the consolidated ship yards of the great lakes. Mr. Robert Wallace of Cleveland is second on the list of stockholders. The holdings of the Hanna and Wallace families are, of course, very much larger than the amount of stock owned by these individuals. The Union Dry Dock Co. of Buffalo is to be a part of the consolidation, and would have been included when organization was effected in New York, two weeks ago, but for delay in concluding a lease of the plant, on account of its control by the Erie Railroad.

At the first meeting of officials of the new company held in Cleveland Wednesday it was decided to allow all matters pertaining to the management of the several plants to continue without change of any kind until contracts are completed. Headquarters will be in the building that contained the offices of the Cleveland Ship Building Co.

The board of directors of the Philadelphia Maritime Exchange has re-elected the following officers: President, George E. Earnshaw; vice-president, Thos. Winsmore; treasurer, J. S. W. Holton; secretary, E. R. Sharwood; assistant secretary, Elisha Crowell, and solicitor, John F. Lewis.

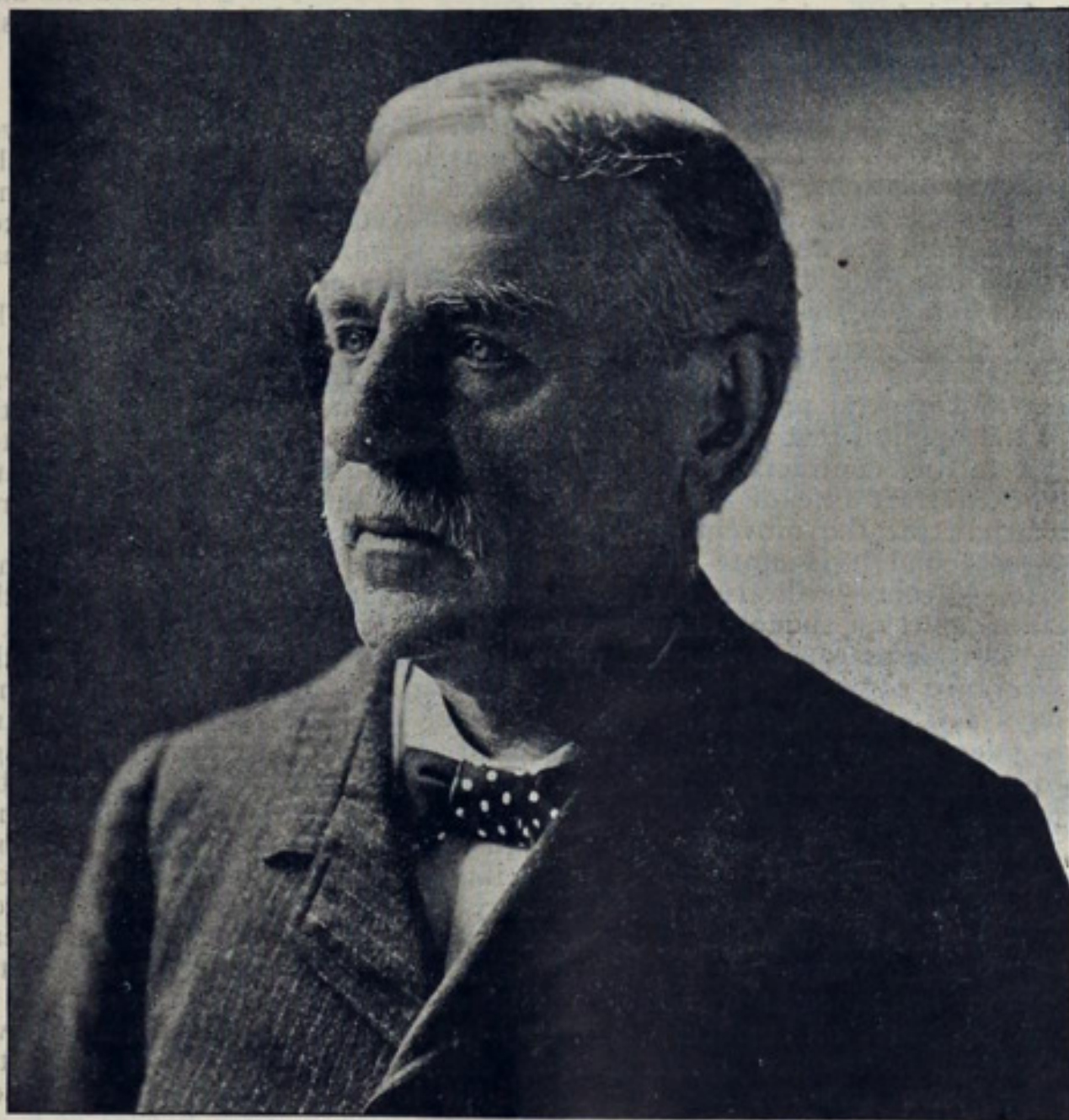
The Morgan Engineering Co., Alliance, O., will make radical improvements at its plant, the additions including a new foundry and a crane shop 65 by 200 feet in size.

FRYE ON SHIPPING.

THE DISTINGUISHED SENATOR, WELL KNOWN AS THE CHAMPION OF AMERICAN SHIPPING INTERESTS IN THE UPPER HOUSE OF CONGRESS, DISCOURSES ENTERTAININGLY AT A TESTIMONIAL BANQUET GIVEN IN HIS HONOR.

Hon. Wm. P. Frye of Maine has for years been looked up to in the United States Senate as an authority in everything pertaining to ship building and the merchant marine, but in all his public career as the acknowledged champion of these vital factors in our national welfare, Senator Frye has never presented in a more masterful manner their claims to primal attention than in a magnificent speech which he delivered at the complimentary banquet tendered him a few days ago by 550 of the most prominent merchants and steamship men of New York. Governor Theodore Roosevelt presided and read a telegram from President McKinley praising the energetic work of the guest of the evening in a manner that drew the heartiest of applause from those present. The toast to which Senator Frye responded was "Our Trade and Commerce Generally and the Best Methods for Promoting Them." He spoke in part as follows:—

"Our great stretch of seacoast, our river navigation and our great lakes have played a most important part in the commercial drama of this country. On the water freight can be carried by steam, on long voyages, for one-quarter, and by sail for one-eighth of the cost by rail. Water rates have decreased rapidly the last decade, and the carriers have been able to make the reduction by about doubling the capacity of their vessels in that time. This, of course, called for a corresponding improvement in the depth of our rivers, harbors and lake channels, and congress fairly well



SENATOR WILLIAM P. FRYE, OF MAINE.

responded to this demand. Here are some of the reductions made in carrying charges on the great lakes: Wheat rate between Chicago and Buffalo, 1887, \$4.13 a ton; 1898, \$1.53 a ton. Iron ore, between Lake Superior and Ohio ports, 1887, \$2.23; 1898, 62 cents. Coal between Lake Superior and Ohio ports, 1887, 90 cents; 1898, 43 cents.

"A very able writer in one of our recent reviews claimed that this reduction of rates on coal and iron, with improved facilities for loading and discharging cargoes, enabled us to compete with the world in iron, steel and their manufactures, and accounted for their increased importation; that such rates were only made possible by the increased tonnage of ships, and that their operation was made feasible only by improved rivers and harbors. Here is surely something to the credit of that much and falsely abused river and harbor bill. Having no occasion to investigate, few men appreciate the enormous domestic commerce carried on our waters. They hear, and correctly, that we have lost our ocean carrying trade, and forget our lake, river and coastwise. While in the former we employ only 700,000 tonnage, and pay \$500,000 a day to foreign ships to carry our exports and imports, in the latter our tonnage of documented and undocumented vessels exceeds seven millions, is nearly, if not quite, eight, and is greater than that of England, France and Germany combined in like trade. It took last year nearly 4,000,000 tonnage to carry our freight on the Mississippi river alone. More ships sail the Detroit river than enter Liverpool or London. The Suez canal, which carries the commerce of the world, passed last year, 8,500,000 tonnage, while there were floated through the locks at Sault Ste. Marie 16,500,000 in eight months. This fleet moves annually

168,000,000 tons of freight and nearly 200,000,000 passengers. This is a protected industry, no foreign ships being allowed to interfere with it; while our foreign carrying trade has no protection, and competes with that which is protected.

"Now, what of our future? Our success last year is most gratifying, but our necessity for foreign markets is certain to increase. Our wonderful inventive genius, the brain power of our workmen, our present and our prospective machinery, the sagacity, enterprise and skill of our manufacturers, all promise still greater advance. In a few years we shall have a population of one hundred millions. What shall this increase do? Farm? Only a small percentage, for now we produce enough for our own, and can supply the necessities of Europe, while Europe is steadily increasing her agricultural acreage, rendering her dependence upon us less and less. It is safe to say that 60,000,000 of our people will in that time be dependent upon non-agricultural pursuits. The commercial war upon which the world has entered will become fiercer and fiercer. Germany will be our most dangerous rival. Her wages paid are not one-half of ours. Shall we reduce ours to the plane of hers? That might breed a discontent which would endanger the republic—would certainly reduce the purchasing power of our people and still more increase the surplus. Shall we run our mills on one-third or one-half time? That would reduce our purchasing power and largely increase the cost of our product. I do not believe that our railroads can reduce freights much unless a new motive power is found, but our water carriers can, and probably will. Freight ships will be increased in carrying capacity and rates still further reduced. Let me illustrate the effect of such increase. When the largest freighter was 3,000 tons, the rate across the Atlantic was \$8.50 a ton; when 6,000 tons, \$6.00 a ton; when 8,000 tons, \$3.50 a ton; when 10,000 tons, \$2.50. All the necessary facilities for these deep-draught ships must be provided for. It was just a look into this future which compelled me to insist, even to the point of obstinacy, that \$7,000,000 should be expended in New York harbor, and that our ships should find there a channel 2,000 feet wide, with a depth of 40 feet, and ample dockage room. I trust, too, that the time is not far distant when we shall have a deep waterway from the great lakes to the Atlantic ocean, still further increasing our facilities and decreasing our rates.

"Another thing, in my judgment, is imperatively required. We should carry in our own ships, under our own flag, all of our imports and exports. We should pay to our own people the \$500,000 a day we now pay to foreigners. We should make of the officers of those ships active, intelligent and interested agents for the discovery of new markets and the promotion of our trade. Suppose to accomplish this it does cost us \$8,000,000 or \$10,000,000 annually, will there not be ample compensation? Great Britain, Germany and France will not surrender this carrying trade without a determined conflict, which alone will reduce freight rates at least 25 per cent. The best estimate, and I think a correct one, of the amount in tons of our foreign commerce is about 50,000,000. The average ocean freight rate for the world over is \$4 a ton; 25 per cent. reduction on rates will save to our people \$50,000,000 annually.

"The Suez canal was opened in 1870. Before that New York was almost as near the Orient as Liverpool was, but after that Liverpool had the advantage by from 3,000 to 4,000 miles. From 1870 to 1888 England's commerce with the East increased 40 per cent., with the rest of the world only 17. Shortened routes and lessened freight charges had their legitimate results. Our government should construct the Nicaragua canal or some other Isthmian water route at the earliest possible time, making it neutral to the world except to any nation at war with us. This would bring us one day's sail nearer Shanghai than Liverpool will be; on the average a thousand miles nearer all the northern ports of China, where we now look for an export trade, and shall hereafter; 1,800 miles nearer Yokohama, 2,000 miles nearer Corea 1,000 miles nearer Melbourne, 1,800 miles nearer Sydney, 3,800 miles nearer New Zealand; from 3,000 to 5,000 miles nearer to the western coast of South America; would bring us 1,000 to 5,000 miles nearer peoples whose imports last year amounted to \$1,120,000,000. Is there an intelligent business man before me who fails to see the enormous advantage to us, in our export trade, by such a shortening of time and space, and the reduction of freight rates between us and these nations, with whom we are on the friendliest terms, and with many of whom we have commercial treaties? I am silent as to the magnificent advantage such a route promises to our domestic trade, bringing this city 10,000 miles nearer by water to San Francisco, the Columbia river and Puget sound, shortening the time by steam from forty to twenty days, by sail from 120 to 65, and reducing freight rates at least one-third; for my discussion this evening is confined to our export trade and its extension."

A LOSS TO THE SHIPPING WORLD.

Capt. Henry A. Bourne, president of the Old Dominion Steamship Co., whose death was mentioned briefly in the last issue of the Review, was one of those energetic, public-spirited men whom the shipping world can ill afford to lose. Capt. Bourne was born in 1829 at the town of Monument on Cape Cod and in after years the citizens of the place had its name changed to Bourne in his honor. He began his vessel career in a small sailing craft, was in command of a transport during the civil war, and then entered the service of the Old Dominion company. In 1873 he was made general superintendent of the line; in 1887, general manager; in 1891, vice president, and finally in 1893 was elected to the presidency of the corporation. Capt. Bourne originated the plan of bringing together once a year the heads of all the different departments under his control for purpose of consultation. At these meetings the policy for the ensuing year was always mapped out and an informal dinner followed.

An unusual piece of ship building work was that performed on the Tyne, England, recently, in the practical rebuilding of the steamship Milwaukee, which had been wrecked while on the voyage from New-castle for New Orleans in September last. The forward part of the ship had been completely smashed and held ashore by rocks, but the after part was cut off and floated safely to dock, where a new bow was built on. Being a vessel of nearly 5,000 tons, this was no small job.

LAUNCH OF THE JOSEPHINE.

THE NEAFIE & LEVY SHIP & ENGINE BUILDING CO. OF PHILADELPHIA PUTS INTO THE WATER A HANDSOME PLEASURE CRAFT BUILDING FOR P. A. B. WIDENER.

What many eye witnesses pronounced the most successful launch ever seen on the Delaware river occurred at the yard of the Neafie & Levy Ship & Engine Building Co., a few days ago, when the steam yacht Josephine, building for P. A. B. Widener of Philadelphia, went into the water. A feature of the launch was the informal but highly enjoyable banquet which followed. Mr. Mathias Seddinger, president of the Neafie & Levy company, presided and in his address of welcome congratulated Mr. Widener on the fact "that the Josephine was built for an American, by Americans, out of American material and will be manned by Americans." The Josephine was built to replace the steam yacht of the same name which was sold to the United States government during the Spanish-American war and rechristened Vixen. The latter boat had the honor of being the smallest vessel that took part in the naval engagement off Santiago which resulted in the destruction of Cervera's fleet. The Vixen is now at the Norfolk navy yard being refitted for a trip to the Philippine islands.

The new Josephine is the largest vessel built at the Neafie & Levy yard in some time and will be one of the finest pleasure craft in the world. She is 257 feet in length over all, 216 feet water line, 30 feet 3 inches breadth of beam, 18 feet 6 inches depth from base line to main deck beams, and 26 feet 6 inches depth from base line to top of awning deck beams. Her displacement is estimated at 1,220 tons and she is guaranteed to make 17 knots. The vessel will be fitted with a quadruple-expansion engine with cylinders of 19½, 28, 39 and 57 inches diameter by 36 inches stroke. Steam will be supplied by two Scotch boilers, each 14 feet 9 inches in diameter, by 11 feet in length.

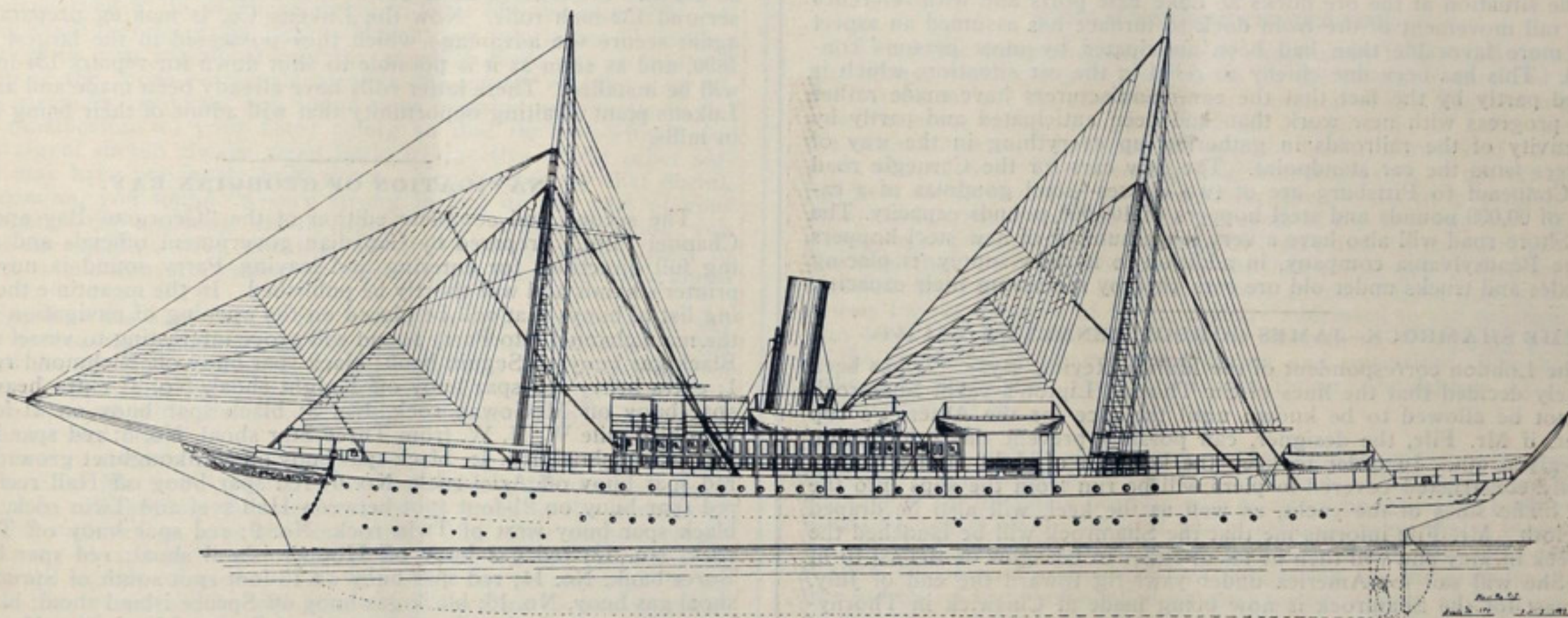
The plans for the interior arrangements of the yacht seem to justify the assertion that in this respect she will be the equal of any vessel of her class afloat. On the main deck will be a ladies' room 18 feet square fin-

HANNA-PAYNE BILL.

SENATOR M. A. HANNA, AUTHOR OF THE SHIPPING MEASURE, SAYS IT WILL SURELY COME UP AGAIN EARLY IN THE NEXT CONGRESS.

Senator M. A. Hanna, author of the Hanna-Payne ship subsidy bill, stated to a representative of the Marine Review this week that no effort would be made to direct attention to the advantages of legislation of this kind until about the opening of the next congress, "but I am very sure," he added "that the bill will again come up for consideration." Senator Hanna said in answer to a question as to the probability of passage of the measure that considerable opposition was, of course, expected. "I do not care to make any predictions as to the bill just now," Mr. Hanna continued, "but I feel confident that not only would the passage of such a measure prove a powerful stimulus to the development of the shipping and ship building industries, and one that would be immediate in its results, but I have personal knowledge of several steamship lines on both the Atlantic and Pacific oceans which will not be established unless the projectors can be assured of the encouragement and assistance which the bounties provided by this bill would afford. The Spreckels interests at San Francisco will not, I am informed, engage in new shipping enterprises as extensively as originally contemplated, unless the bill is passed. It is more than probable also that Jas. J. Hill of the Great Northern Railway will not establish a line under the American flag on the Pacific, as contemplated some time ago, unless government aid can be secured. On the Atlantic, the failure of the measure means the abandonment of several projects that would contribute materially to the upbuilding of our merchant marine. The Norfolk & Western railroad has had under consideration a line to be operated in connection with its road, and I have heard also of a new line to be established from Pensacola, Florida, in event of the bill being adopted."

Answering another question regarding Nicaragua canal legislation, Mr. Hanna said: "I would prefer not to hazard any conjectures on that



STEAM YACHT JOSEPHINE, BUILDING BY THE NEAFIE & LEVY SHIP & ENGINE BUILDING CO., FOR P. A. B. WIDENER OF PHILADELPHIA.

ished in Louis XV. style. Adjoining this, further forward on the starboard side, will be the reception room, 10 by 24 feet, finished with American walnut stiles and panels of French walnut, bearing carvings of American walnut. In this room will be the landing of a stairway, in Louis XVI. style, leading to the library, which will be on the upper deck. This room will be finished to conform with the reception room. Adjoining the reception room will be the dining saloon, which will be in light oak, with carved panels and ceiling. On the starboard side of the dining room will be a passageway leading to the owner's suite, which will be of two rooms, each 19 by 13 feet, finished in curly birch. Each room will have a bath room attached. Aft of these rooms on the same deck will be a stairway leading to the chart room above and to four guest rooms, 12 by 12 feet, which will be below. These four rooms will be finished in birds'-eye maple, and will have a bath room attached. One of the great conveniences is that the owner can go from his quarters forward throughout the whole boat without going out on deck.

The yacht will carry six boats—a steam launch, 30 feet long, of mahogany; a naphtha launch, 26 feet long, of mahogany; two life boats, 25 feet each, of cedar, with mahogany trimmings; a gig, 26 feet long and a dingey, 18 feet long, both of cedar and mahogany, all built by the Gas Engine & Power Co., and Seabury & Co., Consolidated, of Morris Heights, New York. An ice machine will be installed, and there will be an electric storage battery and two dynamos capable of running 1000 16-candle power lights. The yacht will be furnished with a decorative light belt, which will be illuminated with electric lights. The cost of the Josephine complete is given as between \$350,000 and \$400,000. Much of the credit for the perfection attained in the construction of this yacht is due to Sommers N. Smith, the vice president and general manager, who has given the work his personal supervision and the benefit of his vast and very valuable experience in ship building.

Duff & Gatfield of Amherstburg, Ont., who are fully informed as to conditions of water in the shallow part of the Detroit river near Ballard's reef and the Lime-Kilns crossing, announce that it will be entirely safe at the opening for vessels to load to full 17 feet.

score. I do not believe, however, that the outcome of the canal matter, or the discussion attending the proposed construction of that great waterway will effect the shipping bill. The acquisition of our various new possessions and our growing export trade should be the main factor in support of the shipping measure. These new conditions will demonstrate the necessity of providing for our merchant marine some such helpful influence as is proposed by this bill."

CARGO RECORDS ON THE GREAT LAKES.

With new steel freighters now under construction in lake ship yards which are fully the equals in both dimensions and capacity of any heretofore constructed and with some prospect of deeper channels, it will be strange indeed if the present season of navigation does not witness several important changes in cargo records. For future use in matters of comparison there is presented herewith the existing cargo records:

Iron ore—Schooner John A. Roebeling, owned by the Bessemer Steamship Co. of Cleveland, 7,023 gross or 7,866 net tons, Duluth to Conneaut, draught of 17 feet 6 inches; schooner John Fritz, owned by Bessemer Steamship Co., Cleveland, 6,960 gross or 7,795 net tons, Duluth to Conneaut; steamer Superior City, owned by A. B. Wolvin of Duluth, 6,823 gross or 7,642 net tons, Escanaba to South Chicago.

Grain—Steamer Superior City, owned by A. B. Wolvin of Duluth, 266,550 bushels of corn, equal to 7,463 net tons. South Chicago to Owen Sound, draught of 18 feet 2 inches; steamer Superior City, owned by A. B. Wolvin of Duluth, 200,000 bushels of wheat and 41,800 bushels of flax, equal to 7,175 net tons, Duluth to Buffalo mean draught of 17 feet 3 inches; steamer Andrew Carnegie, Wilson Transit Co. of Cleveland, 332,100 bushels of oats, equal to 5,313 net tons, Manitowoc to Buffalo.

Coal—Steamer Hendrick S. Holden, Capt. John Mitchell and others, Cleveland, 6,432 net tons of anthracite, Buffalo to Duluth on a draught of 17 feet 8 inches forward and 17 feet 1 inch aft; schooner Polynesia, James Corrigan of Cleveland, 5,694 net tons of bituminous, Cleveland to Duluth, 16 feet draught.

The Niles Tool Works, Hamilton, O., has installed a large boring mill in the plant of the Bath Iron Works, Bath, Me.

FAVORABLE CONDITIONS AT ORE PORTS.

The advent of May 1 without trouble of any kind among the ore unloaders employed on the docks at Lake Erie ports was a matter of relief to dock managers, vessel owners and others interested in the transportation of ore. It will be remembered that the recent demand of the ore unloaders for an advance of a cent a ton was granted when the dock managers advanced the general unloading rate to 16 cents. This increase was no sooner secured, however, than clamor was made for an advance of another cent. This the dock managers refused, and leaders of the unloaders announced in a semi-official manner that they would strike May 1. The strike question was, however, very probably reconsidered, as reports from docks where ore vessels have arrived thus far are to the effect that all men have continued at work as usual. The men have used good judgment in this regard. The vessels, carrying 60 cent contract ore, could not be made to pay another advance, and the dock interests, on the claim that their expenses are increased this year with no great profit in the business, would have opposed any further increase in wages. In this connection it may be well to note that an erroneous impression has gone out regarding the prevailing system of rebates on ore between the railways, dock companies and furnace companies. On account of certain statements made at a recent meeting of the Lake Carriers' Association, it is thought in some quarters that these rebates come out of the charge of 16 cents a ton paid by the vessel for unloading. "Nothing could be further from the truth," said one of the ore shippers in discussing this matter. "The vessel has absolutely nothing to do with these rebates. The 16 cents a ton for unloading is divided between the wages of shovelers and the cost of operating the docks. If it is claimed that the vessel should simply pay for shoveling the ore into buckets and not for putting it on dock or into cars, which is practically the same thing, then another question is raised, but the rebates to furnaces have nothing whatever to do with this. The rebates are paid by the railroad companies, representing in reality a reduction in the charge for rail haul, and are large or small according to whether the ore is placed on dock or shipped direct to the consumer."

The situation at the ore docks at Lake Erie ports and with reference to the rail movement of ore from dock to furnace has assumed an aspect much more favorable than had been anticipated by most persons concerned. This has been due chiefly to relief in the car situation, which is induced partly by the fact that the car manufacturers have made rather better progress with new work than had been anticipated and partly by the activity of the railroads in gathering up everything in the way of resources from the car standpoint. The new cars for the Carnegie road from Conneaut to Pittsburg are of two classes—steel gondolas of a capacity of 60,000 pounds and steel hoppers of 100,000 pounds capacity. The Lake Shore road will also have a very large number of new steel hoppers and the Pennsylvania company, in addition to its new supply, is placing new axles and trucks under old ore cars, thereby increasing their capacity.

THE SHAMROCK—JAMES GORDON BENNETT'S YACHT.

The London correspondent of the Marine Review says: "It has been definitely decided that the lines of Sir Thomas Lipton's yacht Shamrock shall not be allowed to be known until the race for the America's cup is over, if Mr. Fife, the designer, can possibly prevent this information being given out. In order to keep the keel out of sight at the launch, specially constructed covered-in piers will be run from the slips into the water. The sides of the yacht, as well as the keel, will also be draped with cloth. Mr. Fife informs me that the Shamrock will be launched the last week in May and will then be taken either to Glasgow or Belfast to fit out. She will sail for America under yawl rig toward the end of July. The mast for the Shamrock is now being made at Chiswick in Thornycroft's yard by Fife's men from Fairlie, and I learn that all fittings of cabin, etc., will be done here by them and not at Belfast by Harland & Wolff as at first intended. The mast is of Oregon pine, hewn out of a solid log, and measures from hull to top 110 feet. There has been an innovation in the tapering of this spar and instead of the taper commencing at the deck and diminishing upwards, the greatest diameter will be at the hounds and it will diminish downward. At the cross trees it will be 60 inches girth and grow less going down until at half way down the diameter will be but 50 inches girth, which is carried down to the step. About 15 feet of the length will be below deck and 17 feet will be lost where it is overlapped by the topmast, or as sailors call it, 'the doubling,' leaving 78 feet working length. It is very probable that the gaff and boom will be of steel."

"Not a little interest has been created here in the steam yacht which James Gordon Bennett of the New York Herald is having built by Denny Bros. of Dumbarton, Scotland, by reason of originality of design and the unique features to be embodied in the vessel. She will be what might be called a cross between an unprotected cruiser and a floating palace of the ordinary Watson design. Except for a little stump abaft the funnel for signalling purposes, she will have no masts. Her stem will be of a decidedly warlike kind, while her stern will droop like the Nahma's—another of the same type. Twin-screw four-crank engines of 6,000 horse power will be fitted and a speed of 17½ knots has been guaranteed with a substantial premium for every half knot additional which the builders can get out of the boat."

Considerable interest is attached to the mechanism of electric cranes in use on the Norddeutscher-Lloyd steamers. These cranes have a lift of 17 feet, but there are two sizes, the maximum capacities being 1½ and 3 tons. As many as sixteen of these cranes have been erected on a single vessel. The lift gear consists of a double worm and wheel gearing fixed to a 25 horse power motor running at 900 revolutions. The swivelling motor has a double worm and wheel and a cog wheel transmission with a self-acting stop. For the latter purpose a hand brake is fixed upon an elongation of the motor axle, a slight pressure upon the footplate of the brake being sufficient to stop at once a load descending at the maximum speed. Two marine controllers, behind which are fixed two resistances, serve to start, regulate and turn the motors. Both are directed by a single lever, which is turned in the direction in which it is desired to move the crane.

LARGE SHIP AND BOILER PLATES.

One of the most interesting phases of the development of the ship building industry in the United States, and particularly on the great lakes, is found in the gradual but steady increase in the size and weight of ship and boiler plates. The general run of ship plates at present in use, about 23 to 25 feet in length, is a considerable increase over those utilized some years ago. But these are not extreme lengths. In some cases during the past year plates of a length of from 37 to 40 feet have been supplied for the sides of the largest vessels. It is in the case of shell plates for boilers, however, that the increase has been most marked. Shell plates for boilers for the steamer now building for the Bessemer Steamship Co. at the Globe Iron Works Co.'s yard, Cleveland, are 111-32 inches in thickness, 76 inches in width and 253¾ inches in length. It is estimated that the weight of each of these plates is in the neighborhood of 7,500 pounds. The heaviest shell plates ever used in boilers of vessels constructed on the great lakes were those supplied by Mr. J. F. Corlett, Cleveland sales agent of the Lukens Iron & Steel Co. of Coatesville, Pa., to the Globe Iron Works Co. of Cleveland for boilers of the United States revenue cutters Algonquin and Onondaga, which were built by the Globe company. Engineer-in-Chief Collins of the revenue cutter service, who superintended the construction of these vessels, expressed the desire that each boiler should be formed from only two plates, and consequently the plates were rolled 222¼ inches in length, or just half the diameter of the boiler, and 115½ inches in width, the equivalent of the full length of the boiler. The thickness of 1½ inches has been exceeded by other plates furnished to lake ship builders, but in every instance the width and length of the plate has been less than in that noted, so that the 8,511 pounds weight of each plate for the revenue cutter boilers represents the heaviest plate ever furnished a lake yard.

The development in the matter of width and thickness of plate which may be rolled has, as heretofore stated, shown a steady increase for several years past, but it has never more than kept pace with the demand. In 1890 when the Lukens Iron & Steel Co. installed their 120-inch rolls, the Carnegie works was equipped with 119-inch rolls. Later the Bethlehem plant, which the Carnegie Co. recently purchased, installed 130-inch rolls, as did also the Carbon Steel Co. at Pittsburg, while the Illinois Steel Co. secured 132-inch rolls. Now the Lukens Co. is making preparations to again secure the advantage which they possessed in the largest rolls in 1890, and as soon as it is possible to shut down for repairs 134-inch rolls will be installed. These latter rolls have already been made and are at the Lukens plant awaiting opportunity that will admit of their being installed in mills.

NAVIGATION OF GEORGIAN BAY.

The second and complete edition of the "Georgian Bay and North Channel Pilot," prepared by Canadian government officials and containing full directions for entering and leaving Parry sound is now in the printer's hands and will shortly be published. In the meantime the following list of buoys that will be placed on the opening of navigation to mark the main channel into Parry sound will prove interesting to vessel masters: Black gas buoy on Seguin bank; black spar buoy off Richmond rock, No. 1; extra heavy red spar buoy off Knight shoal, No. 2; extra heavy black spar buoy off McGowan rock, No. 3; black spar buoy on 21-foot spot one-third mile W. N. W. from Three Star shoal, No. 5; red spar buoy off Three Star shoal, No. 4; black spar buoy off Vankoughnet ground, No. 7; red spar buoy off Ariel rock, No. 6; red spar buoy off Hall reef, No. 8; red spar buoy on 21-foot spot between Hall reef and Twin rock, No. 10; black spar buoy west of Twin rock, No. 9; red spar buoy off Telegram rock, No. 12; red gas buoy off Hooper island shoal; red spar buoy off Borer bank, No. 14; red spar buoy on 15-foot spot south of Spruce island shoal gas buoy, No. 16; black gas buoy off Spruce island shoal; black spar buoy off east end of reef awash south of Spruce island, No. 15; red spar buoy off Carling rock, No. 18; black spar buoy off Davy rock, No. 17; black spar buoy off east extremity of Carling rock reef (for use entering or leaving Wabuno channel), No. 19.

The Chicago Pneumatic Tool Co. a few days ago shipped to Tate, Howard & Co., Victoria street, London, a \$30,000 consignment of pneumatic machines—some 250—including Boyer hammers, drills, riveters, rivet heating machines, etc. A considerable portion of these tools were designed for use in ship yards. Another order, amounting to about \$11,000, has just been received for sixty machines for the use of ship building concerns on the Clyde. A \$3,000 shipment was recently made to Sherriff, Swingley & Co., Johannesburg, South Africa, and Russian shipments have been numerous of late. The Chicago company has thus far this year exported \$150,000 worth of its goods.

After lengthy consideration of the matter, the board appointed by the navy department to consider the penalties to be exacted from the ship building firm of Dialogue & Son, Camden, N. J., on account of the delay in completing the gunboat Princeton, has decided to recommend the remission of the penalties due for 213 days of the time by reason of extenuating circumstances. The firm will therefore be obliged to pay for but 214 days, which will amount to \$35,000. The contract called for the completion of the gunboat Feb. 20, 1897, but she was not finally turned over to the government until May 23, 1898.

The Atlantic Transport Co., Baltimore, has sold the steamer Missouri to the navy department as a hospital ship. During the Spanish-American war the Atlantic company, which had previously sold seven of its vessels to the government for \$4,000,000, loaned the Missouri for use as a hospital ship and paid all its operating expenses for more than a year. For this President B. N. Baker received a gold medal from congress. The Missouri is a steel vessel 320 feet long, 40 feet beam and 27 feet depth of hold, was built in England in 1889 and has a cargo capacity of 4,000 tons.

Extensive improvements are being made at the Roach ship yard, Chester, Pa., preparatory to laying the keels for the two steamers for Hawaiian service—the largest vessels yet contracted for by the Roach company. Henneffer & Vaughn of Philadelphia will drive 1,200 piles, upon which cribbing will be laid for the keels of the new vessels.

SIGNALS BETWEEN PILOT AND ENGINEER.

IF PROPOSED CHANGES ARE TO BE MADE, THE SHIP MASTERS MUST ACT EARLY NEXT FALL, BEFORE THE ANNUAL MEETING OF THE SUPERVISING INSPECTORS.

Pickands, Mather & Co., of Cleveland, operating some fifty-six steel vessels on the great lakes, had several conferences with their captains and engineers just previous to the opening of navigation, all with a view to careful operation of the ships, and prompted partly by the fact that the entire fleet is to run without insurance. One of the principal topics of discussion at these meetings was the objection to the rule which provides that the so-called strong backing signal shall be one long whistle or four bells; objection for the reason that on most steam vessels of the lakes the two-whistle backing signal is repeated when it is desired to back strong, instead of using the one long whistle or four bells provided by law. This subject has now been so thoroughly discussed that it is enough to say that Gen. Dumont of the steamboat inspection service holds that the use of any signal other than one long whistle or four bells for backing strong is in violation of the law. It is not his ruling, he says, but a fixed law of the service. He suggests that if a change is desired the parties in interest—there are some 5,000 licensed officers on the great lakes—had better present evidence of the general desire for a change before the next annual meeting of the board of supervising inspectors in Washington in January next. This is the only way to settle the matter, and if the ship masters who have taken the question up allow it to hold over until the middle of next winter they will encounter the same difficulty that they met with when a change was proposed several weeks ago, namely, that the rule can be changed only by the supervising board. What is wanted is prompt action on the part of the captains—and engineers if their cooperation can be secured—immediately after the lake fleet is tied up in December next. A final letter from Gen. Dumont to Pickands, Mather & Co. on this subject is as follows:

Messrs. Pickands, Mather & Co. Gentlemen:—I am in receipt of your letter of April 25, in which, referring to letter of your own of March 14 and my reply thereto of the 16th of March, you inform me of another conference with your steamboat captains, at which there was an informal discussion of the "code of signals between the master or pilot and engineer of steamers" and that you found your captains unanimous in desiring a modification of your (my) ruling so that the two-whistle (or two-bell) signal should always mean back, irrespective of the other signals that may have previously been given. You further say that during your discussion, you found "a very strong feeling on the part of your masters against the one long whistle signal," their argument being, you say, "that the equipment for working the whistle is sometimes likely to jam, which would convert a stopping signal into a signal to work ahead strong."

In regard to this argument of the masters in your employ would say that they no doubt speak on the subject from practical experience of the liability of the equipment to jam. In regard to this last proposition of the masters in your employ would suggest that the use of the "one long whistle" is optional with themselves, as the rule allows them to substitute therefor "four bells."

In answer to the first proposition I can only say what I have already said to the Ship Masters Association at Buffalo in a letter dated April 11, who made substantially the same request as made in the petition of the masters employed in your service, namely, that their request "practically asks me to change a rule of the board of supervising inspectors in relation to the signals referred to. As this office has no authority to act in the case, the matter will be laid before the board for its consideration at its next annual meeting in January next." I further informed them that this office has had no intention to promulgate any ruling on the subject, not considering it necessary to do so, as the rule for going ahead or backing strong, namely, "one long whistle or four bells," is so plainly laid down in the rules, that no further promulgation than the rule itself seems necessary, and all the officers must obey said rule, unless changed at some time in the future by the proper authority; as a failure to do so, would be deemed by the courts, as a prima facie case against any vessel, in a case of a collision neglecting to obey, or using other than the rules laid down by the board.

I would suggest, in view of the fact that there are 5,000 licensed officers on the lakes, that during the coming season a more general expression of the views of such officers on the subject of a change in the rules be obtained for presentation to the board, than has so far been received. This would be desirable so as to satisfy the board that any changes they might adopt would not be opposed after adoption. In conclusion would suggest that you ask your masters, and inform me of the result of your inquiry, which signal they would propose to adopt to immediately stop backing and go ahead, should an emergency require such action, assuming that the board should grant their request to so amend the signal rules between pilot and engineer that such rules would peremptorily indicate that "two whistles or two bells" should "always mean back."

JAMES A. DUMONT, Inspector General.

Office Steamboat Inspection Service, Washington, D. C.

Charles D. Mosher, well-known naval architect of 1 Broadway, New York, has designed another fast steam yacht, to be built at Nyack, N. Y., for Charles R. Flint. The vessel will be 135 feet water line, 12½ feet beam and 4 feet draught, with engines that are expected to give her a speed of 42 miles per hour. Mr. Mosher even hopes to exceed in this racer the record made by the famous yacht *Ellide*, which he also designed.

The entire western business of the H. W. Johns Co. has been purchased by the Manville Covering Co. of Milwaukee. It is reported that the latter firm will maintain a large store in Chicago at 173 Randolph street, in charge of T. G. Younglove and another at 516 North Main street, St. Louis, in charge of Wm. A. Buddecke.

It is stated that the Clydebank Engineering & Ship Building Co. will undertake at Southampton the work of fitting the American line steamers *St. Paul* and *St. Louis* with bilge keels.

BROKEN SHAFTS IN ABUNDANCE.

Consternation has been created in England by the number and magnitude of recent accidents to British vessels through some failure of their shafting. It seems that vessels of all sizes and ages figure in the lists of accidents, the boats affected ranging from 40 to 7,000 tons burden. Eleven of the shaft failures, or about 14 per cent of the breakdowns reported during the first three months of 1899, occurred on steamers built in 1898. Two of these new steamers were small boats of 650 and 478 tons, respectively. Eliminating these, however, the average tonnage of the other vessels which have met with breakdowns is 3,256. British technical journals say that the ship builder is not alone to blame but that the blame must be shared by the ship owners, shaft forgers, classification societies and underwriters. It is alleged that all sorts of scrap material is frequently used for shaft forging. The lack of care in the selection of the scrap precludes the possibility of the perfect cohesion between the particles of the shaft which is essential, and accordingly there is an increase in the tendency to develop flaws and fractures when subjected to the abnormal strains of a rough voyage. Of late the classification societies have attempted to stay the tide of shaft disasters by increasing the diameter of shaftings. Of the seventy-eight accidents reported during the first three months of 1897, about twenty-two, or 30 per cent, were in ballast, while of the eleven ships built in 1898 eight were in ballast.

In a paper read recently before the North East Coast Institute of Engineers and Ship Builders, Mr. E. C. Chaston said that fully 50 per cent of the shaft defects and failures are due to preventable causes. He did not attribute any great degree of blame for existing conditions to defective forgings, but was inclined rather to the belief that the principal source of shaft failures is to be found in defective liners, wrongful system of coupling and badly fitting propellers. Mr. Chaston makes a plea for more frequent drawing of shafts for examination, and another of his suggestions is that sea-going engineers should bestow more care upon the shaft and its appurtenances and not confine their attention exclusively to the engine room.

STEAM ENGINE INDICATOR.

This is the comprehensive and self explanatory title of a little volume just issued, which comprises directions for the selection, care and use of the instrument and the analysis and computation of the diagram, together with numerous tables. In his preface the compiler, F. R. Low, says that the steam indicator "has become at once the tool of a trade and the instrument of a science. The operating engineer employs it to perfect the adjustment of valves and to measure power, the physicist to investigate thermodynamic transfers and to trace the cycle of the heat engine. It is to steam engineering at once the commercial scale and the chemical balance." The contributions to the literature of the instrument and its diagrams embodied in the volume just issued have been prepared from time to time by writers for the columns of *Power* and are addressed to the practical man who desires to apply the indicator as an instrument of ordinary precision to the problems of steam engine design and operation. The book is elaborately illustrated. Published by the Power Publishing Co., New York. Price \$1.50.

One of the leading ship owners of Cleveland, glancing over a copy of the *Great Lakes Register*, a few days ago, said: "Whatever may be the outcome of the uncertain position now occupied by insurance brokers and insurance agents on the lakes, it would certainly seem that a register so valuable as that issued by the Chicago people should be supported and will anyhow be adopted as the standard publication for the classification of lake vessels. I have just applied for class for my vessels, as I felt satisfied on first sight of the book that it had come to stay. It is plain that the collection of information necessary to the preparation of such a work must be worth thousands of dollars, and with such a beginning there is no question of the *Register* being eventually removed from connection of any kind with insurance influences. No classification register in the world is more carefully arranged, and with this qualification at the outset it is only a matter of a little time until the book will be to the lakes what *Lloyd's Register* is to the shipping world. It will certainly be entirely removed before long from the insurance connections that have been a drawback to it up to this time."

The Brown Hoisting & Conveying Machine Co. of Cleveland, has issued a magnificent 175-page catalogue descriptive of the various forms of cranes which they manufacture. This volume, which is illustrated by upwards of a hundred fine half-tone plates, should be of especial interest to ship builders, by reason of the fact that the cantilever and other types of cranes which the Brown company has furnished to the Newport News Co. and other leading ship builders in this country and abroad are fully illustrated and described.

A Philadelphia correspondent writes: Extensive newspaper reference to the combination that has been formed among bearing metal concerns in this country prompted inquiry at the office of the Ajax Metal Co. in this city as to what their position will be. One of the officers of that company said: "We are not a part of the combination and do not propose to have anything to do with it—good, bad or indifferent. We propose to continue in our regular way in the future as in the past, giving our patrons metal of the best quality at the lowest possible price."

It is announced from England that the name *Victoria* and *Albert* will be given to the new royal yacht, which will be launched from the Pembroke dock yard by the Duchess of York May 9. When completed this will be the third royal yacht with this title, the others bearing this name having been launched at Pembroke dock in 1843 and 1855 respectively.

At the annual meeting of the New York Maritime Association, held a few days ago, all the old officers were re-elected with the exception of H. H. Brown of the auditing committee, who declined to serve another year. George T. Hay was elected as his successor. It was decided to raise the limit of membership to 1,200, and the initiation fee was reduced from \$500 to \$100.

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It is extremely gratifying to note the increasing realization in all quarters of the importance of the steel ship building industry on the great lakes and the opportunities which its full utilization would offer. In a recent issue, the Army & Navy Register says editorially: "A step in the right direction has been taken by the navy department in securing information of the capacity of ship building plants now on the great lakes. The reports, when they are received, will show the facilities at each establishment for the construction of war vessels. There is no reason why this industry should be discouraged and killed, as it has been by the continuance of an antediluvian document drawn up more than eighty years ago and intended by those concerned in its composition to tide over a period of suspicion between the governments represented on the shores of the great lakes. The Rush-Bagot agreement is a relic of diplomacy. It outlived its usefulness many years ago, and it has survived to the detriment of an important and worthy industry in a certain section without rendering any adequate compensation for the restrictions it imposes upon this government. The present may surely be accepted as the time when the United States and Great Britain have least to fear of each other and when neither government need be afraid to trust the other with war ships on the great lakes. It will not be possible to build vessels of deep draught at lake ports, but the naval architects will be able to design ships of a special type which contemplates a heavy battery on light draught vessels. This is a detail of design and construction which does not impress naval constructors as a momentous problem and it will be possible to open the lake ship yards to the profitable production of the specially designed war vessels which will be of great value, not only on the lakes but in other sections of the world, notably, for instance, on the Asiatic station. The facilities at the command of the government along the great lakes are abundant and impressive. The reports will show that there are many opportunities for hull and machinery construction second to none in the country. We are glad to see that the navy department is securing information which will be of service when the Rush-Bagot blight is removed."

"Ship building and marine engineering follow cheap steel as surely as night follows day; for it is just those national characteristics which insure success in one branch of the trade that are needed in the other." This significant paragraph is taken from a leading editorial in Engineering of London, one of the most influential journals of its kind in the world. The subject under consideration was an address dealing with "A Decade of Progress in Reducing Costs of Manufacturing Iron and Steel in America," recently delivered by Mr. C. Kirchoff, president of the American Institute of Mining Engineers. "It has been sufficiently shown," says Engineering, "that immense reductions have been made in the cost of production in America during the last ten years. The result of this has been seen in the vast strides which have been made in the industry during the same period, so that we may conclude that the improvement has not only been relative to a given year, but absolute as compared with other countries. We have in this country by now realized the fact that not only can we not expect to supply the United States with iron and steel, but that we must look upon American steel makers as our rivals in foreign markets; and even beyond this, our own steelmakers cannot treat with impunity American efforts to send manufactured steel to be used within our own borders. This, of course, is a state of affairs that the sturdy and self-reliant Briton would have scoffed at had it been predicted of a protectionist country ten years ago; just as other forecasts are treated with like contempt in the present day. We rejoice that this competition—which was bound to come from some quarter sooner or later—is proceeding from a people chiefly of our own race; who are dominated by the same impulses and national instincts as ourselves, who are governed by similar laws, who speak the same speech, and who so largely think the same thoughts as ourselves. Still it is a competition, and one which we cannot afford to neglect unless we are content to see our manufacturing industries pass out of our hands. Iron and steel making are the foundations, and almost the superstructure too, of an engineering industry, without which the commercial prosperity of this country cannot exist."

Rear Admiral Lord Charles Beresford of England, who recently visited this country, declared at a dinner given a few evenings since in London by the Institution of Mechanical Engineers, that Great Britain was much behind the United States and Japan in the use of electricity as a motive power aboard warships. He had been amazed, he said, to see the great use of electricity aboard American warships, it being employed where the British still used steam. In consequence the American vessels are far cooler than those of Great Britain. Lord Beresford said that not the slightest apprehension need be felt in England regarding submarine boats. He believed them far more likely to blow themselves up than to destroy the ships of the enemy.

The vexed question of vessel taxation is gradually being settled on the lakes by several of the states adopting special laws to cover vessel property. The result will be that the states holding to the old rule of trying to collect from the ships taxes equal to that charged up against personal property in large cities will find themselves without vessels of any kind from which to collect taxes. The home of the ship is easily changed. Wisconsin has just adopted a law similar to the Minnesota law, which provides for a tax of 3 cents per gross ton.

SHIP BUILDING AND ALLIED INDUSTRIES.

A SUBJECT THAT CONCERNS NOT A FEW OWNERS OF SHIP YARDS BUT THE WHOLE NATION—IF WE CAN UNDERSSELL THE WORLD IN BRIDGES, RAILS AND THE LIKE, WHY NOT IN SHIPS.

The development of our shipping interests is not a matter of concern to the individual ship owner alone, as some people seem still to suppose. In a country so extensive as this, with so much of the population remote from the seaboard, it is perhaps not surprising that public sentiment should be concerned less about ocean traffic than in the European countries where opposite conditions prevail. Our sailing masters of a century ago owned their ships and their cargoes, and their business was about as private a matter as any business could be. But changes have been wrought in the shipping interest no less than in transportation by rail. The progress or decline of ocean and lake shipping are matters of national or international importance. We hear of the growth of ship building in German yards, or of the failure of subsidies in France to expand her merchant marine, or the satisfaction with which the British commercial world regards the fact that, despite the competition of foreign powers, British ship builders are turning out more work to-day than ever before—all without reference to the individual ship builder. When publicists of the old school wonder how it can be that England can import more merchandise than she exports, the fact comes out that the large amount of English capital invested in ocean shipping is earning dividends that help largely in making a favorable showing where, under other circumstances, the opposite might be true. Besides, ships built in British yards for foreign account are beginning to appear in the monthly returns of exports, further helping to make a favorable "balance of trade" for the nation. But there is no question as to whose ship yard is turning out more work or less; the fact that such work is being done is the important thing.

It is surprising to how many different branches of industry the ship building industry is important. As the London Times points out, the crowded condition of the ship builders does not mean activity in the ship yards alone; "it involves a corresponding amount of pressure on marine and mechanical engineers, electrical contractors and engineers, iron and steel manufacturers, and the makers of the hundred and one different articles of greater or less importance that go to make up the equipment of the average ship." The total value of mercantile ship building completed in British yards during 1898 has been estimated at \$100,000,000. The value of the orders which this construction furnished during the year to the engineering industries generally, including electrical engineers, is said to have exceeded \$25,000,000, with equally large figures for the orders placed with iron and steel manufacturers. In all these respects the work on naval vessels is likewise important. The value of ship building on hand in Great Britain at the beginning of the year, for the home and foreign navies, including guns and other equipment, was estimated at more than \$100,000,000. In addition to this consumption of so many products of the metal trades are to be considered the varied forms of wood work involved, and the many articles of equipment other than metal which find use. There is no other single product of industry which is so great a world in itself—demanding something from so many forms of human skill and labor—as a first-class passenger steamer, unless it be a modern first-class battleship. Hence, in a ship building country, practically every branch of industry is benefited by the opportunity which exists for participation in the construction or equipment of vessels.

The leaders in various American industries justly take pride in their success of late in extending the shipments of their products abroad. Questions have been proposed in the British House of Commons with a view to discovering why Americans have suddenly become so important a factor in fields of trade in which formerly they were unknown. On the Continent has been recalled the speech publicly delivered a year or two ago by an Austro-Hungarian minister, declaring that it might become necessary for industrial Europe to combine for mutual defense against transatlantic competition. The London Times, however, takes comfort from the thought that the recent American triumphs in the foreign trade field have been due to exceptionally low prices here, but that prices are rising to the level existing abroad, when any advantage on the side of the American exporter will disappear. Before accepting this forecast too confidently, however, it may be worth while remembering that, not so many years ago, this same English journal was skeptical as to the possibility of a tin plate industry being built up here which should render America independent of the Welsh product.

If lower cost of production alone can make the United States a trade rival to be feared in Europe, the inventiveness of our people can be depended upon to prevent any prominence which may have been gained already in foreign fields from diminishing in the near future. Meanwhile there is no other market preferable to the home field, and a home ship building industry should be no less beneficial to the steel and engineering trades in the United States than has proved to be the case in Great Britain. If we can undersell the world on bridges and rails and the like, why should it longer appear that ship building must cost more on this side of the Atlantic than on the other side? We have even been exporting material for ship building, including an important quantity of plates for the Oceanic—a vessel launched recently at Belfast, and which is the largest ship in the world. Her builders, by the way, are said to have so many orders on hand that no new contracts will be taken for completion under five or six years. Not a few orders for iron and steel have been placed in the United States of late on account of the uncertainty when foreign plants could fill them; perhaps a similar opening may exist for the expansion of our ship building, since no indication appears of a declining demand for ships. Perhaps, also, this opening might be discovered sooner were the subject of a great American ship building industry to be studied in its relations to all the other industries which would be benefited by its development, and not merely as a subject which concerned only a few capitalists in control of the ship yards.—Iron Age.

D. E. Lynn, who has been with the Dunham Towing & Wrecking Co. of Chicago, is to represent on the lakes the American Mfg. Co. of New York, one of the largest rope concerns of the country.

LIGHT-HOUSE ILLUMINANTS.

A SCIENCE THAT HAS HAD THE SUPPORT OF MARITIME GOVERNMENTS FOR FULL 400 YEARS—OIL IS STILL ALMOST INVARIABLY USED IN AMERICA—ELECTRIC LIGHT DOES NOT PENETRATE FOG GAS HAS ADVANTAGES BUT IS EXPENSIVE.

BY LAWRENCE IRWELL.

In the reign of the English king Henry VII (1485-1509), there existed a company of mariners who had authority by charter to prosecute persons who destroyed sea-marks, etc. In May, 1514, Henry VIII formed this company into a perpetual corporation by the style of the "Master Wardens and Assistants of the Guild of the Undivided Trinity, in the Parish of Deptford Strond in the County of Kent." Although the functions of this society have been very much curtailed, the shipping world owes to it a debt of gratitude, since it was the originator of the first attempt at the scientific illumination of dangerous spots on the coast.

The methods employed to utilize the light given out by the burning of oil are two—the catoptric (*a*) and the dioptric (*b*) systems. The first named of these necessitates the use of a number of small lamps, each with a polished reflector behind it, while the latter employs one central lamp and an adaption of lenses.

Where gas is used in a light-house it has, of course, to be manufactured with the utmost care, and the use of this illuminant necessitates a very material increase in the light-house staff. The Wigham patent gas burner was introduced in 1865. This burner consists of five concentric rings of gas jets, the innermost ring having twenty-eight, the next forty-eight, then sixty-eight, and the outermost 108 burners. The diameter of each ring is 4, 6½, 8½, 9½ and 11 inches. It is said that the light from twenty-eight gas jets is equal to four wicks where oil is consumed. By bringing more gas burners into use, the light can be adjusted to suit the condition of the atmosphere. Fog, the most potent of atmospheric light-quenchers, is less able to extinguish the rays of gas light than those emanating from any other source. It is sometimes urged in objection to gas as a light-house illuminant that it is impossible to direct all the light—that the well-known gas glare cannot be obviated, even with the most perfect apparatus and appurtenances—but this is not an important objection. The zone of vague illumination serves to reveal in dense weather the whereabouts of the light-house, although the optical opacity of the atmosphere may be such as to quench all the directed rays. The cost of light-house gas never exceeds \$3 per thousand feet. This is, of course, far above the cost of a similar quantity of coal gas, manufactured for domestic purposes. The discrepancy in price is accounted for by the small quantity usually made at each station, and also by the best possible coal being employed in the process. The relative intensity of this special coal-gas compared with the gas manufactured for domestic consumption is as thirty-five to sixteen. The late Professor Tyndall thus pronounced upon the merits of gas as a light-house illuminant: "It may be beaten in point of cheapness by mineral oil, but in point of handiness, distinctiveness and power of variability to meet the changes of the weather, it will maintain its superiority over all oils."

Much was expected from the electric light. Its intensity is such that many persons believed it would shine steadily and distinctly through all conditions of atmosphere. But these expectations have not been fulfilled. Vivid it is, and searching it may be, but its utter inability to penetrate through a fog of any density has been conclusively proved. The British Shipmasters' Society reported in 1891 that "many members of this society on active service frequently passing from the Thames to sea, and vice versa, have often represented the poorness, sometimes invisibility, of the electric lights during certain conditions of hazy atmosphere, at times when the oil lights of light-ships, etc., and the gas lights of seaside towns have been comparatively bright and distinct. Again, complaints have been made of the intense and blinding effects produced on navigators by electric lights, such as the South Foreland on vessels in its immediate vicinity." This is the opinion of those mainly concerned in the efficacy of warning lights, whose very lives depend upon the vividness of the friendly rays emerging from the lantern towers. This verdict is endorsed by nautical opinion in this country, and those interested in good lighting as long ago as 1890 requested that the electric light be withdrawn. As far as the writer has been able to ascertain, oil is almost universally used in American light-houses. The beacon at Sandy Hook is still lighted by electricity, as are some of the buoys at the entrance to New York harbor. The electric light at Hell Gate was discontinued in 1886, because its brilliancy dazzled the eyes of pilots and prevented them from seeing objects beyond the illuminated circle. The French light-house authorities have given the electric light a prolonged trial, but it caused so much dissatisfaction and so many complaints that it has been gradually abandoned.

There is, however, one service which the electric mode of illumination performs in a thoroughly satisfactory manner. Sky-flash signals are, of course, referred to. A beam of light thrown into the upper sky is extremely useful to navigators in determining a ship's position before the true light itself is visible over the convexity of the earth. Supposing a ship making for shore sights an overhead light, she is enabled to locate her position thereby. If bad weather were now to come on, she would be able to steer in confidence in the direction of the true light and would come within its range, although had she not been guided by seeing the overhead light before the bad weather came on, she would have had to grope her way until well within the zone of the true light. In many conditions of weather, as may readily be imagined, the vertical beam would not be of the slightest use. How far off the sky-flash light can be seen is difficult to determine. The Hollman light on the coast of Denmark has been discerned at a distance of fifty-one miles; the Calais light (France) at a distance of thirty-six miles; and several English lights at distances varying between forty-one and forty-nine miles.

Light is not, however, only thrown from some light-houses upon the sky, but at many towers there are subsidiary beams which are used to

throw light upon some danger spot in the immediate vicinity of the light-house. For this purpose colored lights are usually employed. But their use is attended with so much loss of power that it is but rarely that they are employed as first-class principal lights. Red is more often used than green, and the latter color is not employed as a main feature in any light-house. If a red beam of light is to produce the same effect at the same distance as a beam of white light, then the quantitative ratio of the lights that produce the beams must be as twenty-one is to nine or ten, the extra amount of light being required for the red beam to compensate for the light absorbed in passing through the red glass. The importance of the work achieved by these subsidiary lights is best exemplified in the following manner: The sea surrounding the light-house is divided into eight irregular areas, each area being marked in a distinct manner. The main or seaward portion is the largest, having an illuminated arc of about 180 degrees. The other areas are, of course, much smaller in extent. Vertical strips of variously-colored glass, through which the light is made to pass, illuminate the different areas in a most marked manner, the diversity of characteristics being aided by a tower light in the same tower 20 or 30 feet below the main light.

About six years ago the Wigham "Giant" light-house lens was introduced to the world. In the year 1885, a step in the direction of large lenses was taken by the commissioners of Irish lights when they established at the light-house on Belfast Lough, lenses 4 feet high by 3 feet 7 inch in width, but still with the 920 millimetre focal distance. Later on experiments were made with a lens having the focal distance of 1330 millimetres. This was known as a hyper-radiant lens, and it was found, when used in conjunction with large burners, to have practically double the illuminating power of any lens previously made. The "Giant" lens, however, has the axial (rotating) intensity of 800,000 candles, and when it is set up on the quadrilateral system, each of the four faces of the apparatus measures 10 feet wide by 22½ feet in height; and when fully equipped, the emergent beam of light from the quadrilateral arrangement is calculated at 5,000,000 candles. In making this computation, allowance has not been made for the fact that the peculiar spherical form of the lens will return to the flame the whole of the light reflected at the first refracting surface, so as to increase the amount of light emitted directly from the flame towards an opposite panel, which light in the case of an ordinary plain lens is wholly lost. This apparatus seems to be about as perfect as human ingenuity can devise. Although no light-house illuminant has yet been produced that can satisfactorily penetrate fog, yet this light may be relied upon to illuminate the densest fog to some extent, and so show the approximate position of the light-house.

Concerning the electric light, it has been a subject of much controversy as to which nation first employed it as a light-house illuminant. In December, 1863, it was used by France. But as far back as 1857 experimental trials were made in England. In 1858 and 1859, that country made use of it at South Foreland. After February, 1862, the electric light shone from another tower—Dungeness. Since that date, electricity has had a fair trial, and under certain atmospheric conditions—not very prevalent upon this side of the Atlantic—its powerful rays are found to be completely quenched. Now that all authorities are agreed that the electric light is not a complete success under all conditions, it remains to be seen to what extent coal gas will supersede oil.

CRITICISM OF BRITISH CRUISERS.

Daniel E. Phillips, United States consul at Cardiff, Wales, sends the state department a short description of four armored cruisers under construction in England, together with certain criticism regarding them from Sir E. J. Reed, naval authority. Consul Phillips writes:

"I recently paid a visit to her majesty's dock yards at Pembroke dock, and by the courtesy of the chief construction engineer was conducted through all the machine shops; saw the near completion of the royal yacht, soon to be launched, and the armored cruiser in process of building. About 2,400 men are engaged in these dock yards. Everything proceeds with the regularity of clockwork. The royal yacht has been so frequently discussed that I shall confine my observations to the new cruiser in course of erection at Pembroke dock, which is to have a displacement of 9,800 tons. A similar vessel is also to be built at Portsmouth and two other armored cruisers of the same displacement are to be erected by contract. These four vessels are officially represented as cruisers Nos. 1, 2, 3, and 4. Their main features will be identical. The dimensions of the new Pembroke cruiser, I understand, are to be as follows: Length, 440 feet; breadth, extreme, 66 feet; displacement, 9,800 tons; speed, with natural draft, 23 knots; indicated horse power, 22,000; armament, fourteen 6-inch quick-firing guns, 4-inch turrets and 10-inch casemates, ten 12-pounder quick-firing guns, three 3-pounder quick-firing guns, and two torpedo tubes. The 6-inch guns will be of the latest type and will be protected by armor 4 inches thick. Vertical side armor of the same thickness will be carried over a considerable portion of the length, with thinner armor on her bows. Strong protective decks will be associated with the side armor. The steel hulls will be unsheathed. A speed of 23 knots is to be maintained for eight hours consecutively, on contractor's trials. In smooth water, about 21 knots should be maintained for continuous steaming at sea. The coal-bunker capacity will be 2,500 tons and 1,250 tons are to be carried on board at the speed trials.

"Sir E. J. Reed, one of the foremost engineers of Great Britain and formerly member of parliament for Cardiff, undertakes to criticise the plan of the government for the building of these new cruisers. His attitude in this connection is regarded by many competent authorities as hypercritical. The difficulty, to Mr. Reed's mind, is that the cruisers are to be so small. A fast vessel, with next to no protection and two or three light guns, is all that is necessary for preying upon British commerce. The vessels sent out for the protection of that commerce and the pursuit and destruction of the enemy should be at least equal in speed and possess sufficient offensive and defensive power to overcome these small commerce destroyers. His object, therefore, is to urge the admiralty not to cut down these vessels, the designs of which are not definitely settled, to such small dimensions and tonnage as to make them too feeble for their purpose."

a—Catoptric—produced by reflection from mirrors.

b—Dioptric—produced by a central lamp through a combination of lenses surrounding it.

WORK THAT OCCUPIES THE SHIP YARDS.

The recently organized William Skinner & Sons Ship Building & Dry Dock Co. of Baltimore has purchased, at a cost of \$63,000, a large tract of property adjoining its plant. The Baltimore correspondent of the Review reports that all the yards in that city are well occupied with work. New tonnage now under construction is as follows: At the Columbian Iron Works.—A twin-screw passenger and freight steamer for the New York & Hartford Transportation Co.; steel tug for the Consolidated Coal Co.; United States revenue cutter Seminole; United States submarine torpedo boat Plunger; United States torpedo boat Tergley. At Sparrow's Point.—Twin-screw steel steamer for the New York & New Haven Steamboat Co.; two 5,000-ton steam colliers for the Boston Towboat Co.; three 30-knot torpedo boat destroyers for United States navy; steel tug for Baker-Whitely Coal Co. At the R. M. Spedden Co.'s works.—Steel despatch steamer for United States government. Thomas McCosker & Co.—Ninety-foot tug for P. Dougherty Co. David Thursby.—Two large wooden barges.

Specifications have been prepared for a new steamer to be built, probably at some Pacific coast yard, for the Alaska Packers' Association. The vessel will be of the following dimensions: Length, 217 feet over all; beam, 35 feet; depth of hold, 18 feet. She will be built of steel with cellular double bottom and six water-tight compartments, and will be constructed in excess of Lloyds requirements. She will have two triple expansion engines, with twin screws. Diameters of cylinders are to be 9, 15½ and 27 inches, with 24 inches stroke of piston. Steam will be supplied from water tube boilers, allowed a working pressure of 225 pounds to the square inch, and her speed will be 10 knots. The steamer will be fitted with steam steering gear, capstan, windlass and towing machinery, and she will also have an electric plant. Her lower hold is to be 108 feet clear length and her hatches of large size, so as to facilitate the handling of long timber.

The Neafie & Levy Ship & Engine Building Co., Philadelphia, a few days ago launched two steel towboats. The Cheltenham, building for the Philadelphia & Reading Railway Co., is 92 feet over all, 19 feet beam and 10 feet depth of hold. She will be fitted with compound engines with cylinders of 15 and 26 inches diameter by 22-inch stroke, to which steam will be supplied by boilers of 110 pounds pressure. The Syosset, building for the Long Island Railroad Co., is 112 feet over all, 23 feet beam and 12 feet 2 inches depth of hold. She will be fitted with compound engines, with cylinders of 20 and 40 inches diameter by 28 inches stroke, to which steam will be supplied by boilers of 125 pounds working pressure.

The Union Iron Works, San Francisco, has secured from the San Francisco & San Joaquin Valley Railroad Co. an order for a ferryboat to run between San Francisco and Point Richmond, the proposed western terminus of the line. The vessel will be of side-wheel type, 238 feet in length, 64 feet beam and 17½ feet molded depth, and will draw 10½ feet of water. The hull will be of steel, and the boat will be fitted with compound engines capable of driving her at a speed of 16 miles. The capacity of the cabins will be 700 passengers. The vessel is to be completed inside ten months.

The ship yard of the Pusey & Jones Co., Wilmington, Del., is exceedingly busy at present. The ferryboat B. M. Shanley, building for the Point Richmond & Bergen Point Ferry Co., is well along towards completion, almost all the machinery being in position. All the frames of the yacht Willada are in position and the work of putting up plates has begun. Plating work is also under way on the yacht Kismet, building for J. Rogers Maxwell of Brooklyn and excellent progress is being made on extensive repairs to the light-house tender Zizania.

The Ocean Navigation & Construction Co. of Plainfield, N. J., has been incorporated with a capital of \$125,000. The object of the company is to construct and operate steamers, and the incorporators include James R. O'Bierne of 32 Broadway, New York; Charles G. West, Greenwich, Conn.; George E. Waldo, 34 Nassau street, New York; Robert E. Waldo, Plainfield, N. J.; and Joseph G. Robin, 32 Broadway, New York. Robert B. Waldo has been named as resident agent. His Plainfield address is 32 East Sixth street.

George E. Currier & Son of Newburyport, Mass., have secured from Boston parties an order for the construction of a 1,600-ton four-masted schooner, to be ready for launching early in 1900. This contract revives an industry at Newburyport which has been stagnant since 1892. The firm of Currier & Son are also negotiating for the building of a 250-ton steam lighter.

The Merrill-Stephens Engineering Co. of Jacksonville, Fla., has secured from the Plant line the contract for a new side-wheel steamer for service in Florida waters. She will be 120 feet in length, 21 feet beam and 3½ feet draught, with inclined engines and when delivered in October will cost in the neighborhood of \$25,000 or \$30,000.

Lawrence Jensen of East Gloucester, Mass., has begun work on a yacht for Fred L. Pigeon, Commodore Hastings and Vice-Commodore Felton Bent of the Annisquam, Mass., Yacht Club. The yacht, designed by A. Crowningshield of Boston, will be 38½ feet over all, 21 feet water line, 9 feet 3 inches beam and 9 inches draught.

The Tietjen & Lang Dry Dock Co. of New York is having a large floating dock built at Perth Amboy, N. J. The new dock will be about 400 feet in length by 100 feet in width, and will accommodate vessels of 5000 tons. When completed it will be located at Hoboken, N. J., alongside the other large docks of the company.

The Union Iron Works, San Francisco, has just received an order for another vessel for the Hawaiian trade. The vessel is for the Wilder Steamship Co. of Honolulu and will be utilized in the inter-island trade. She is to be of wood and of about 450 tons; speed 12 knots.

George C. Morris of Wilmington, Del., will establish a small ship yard at the corner of Front and Reaney streets, Chester, Pa. A specialty will be made of life boats and life rafts. Contracts for the erection of the necessary buildings have already been let.

The Big Kanawha Towboat Co. of Winifrede, W. Va., has been incorporated by Thomas E. Baird and D. W. Chandler of Philadelphia; J. W. Johnson, J. A. Parker and C. A. Johnson of Proctorville, O., and R. B. Cassady of Charlestown, W. Va.

Capt. James Davidson of West Bay City, Mich., has laid the keel for a tug of 115 feet length, 24 feet beam and 11 feet depth, which he is to build for Port Huron parties. Between 500 and 600 men are now employed at the Davidson ship yard.

Miller F. Moore & Co. will remove their ship building plant from Elizabethport to Harrison, N. J. It is stated that the plant to be erected at the latter place will cost \$100,000 and will give employment to more than 300 men.

As announced some time ago the Lozier Manufacturing Co. of Toledo, O., has gone into the business of building steam launches and has secured a contract for a handsome 35-foot launch for use at the Casino at Toledo.

The torpedo boat Dahlgreen, building at the Bath Iron Works, Bath, Me., will be launched about the middle of May, and her sister vessel, the T. A. M. Craven, will be put into the water a few weeks later.

The Bethlehem Construction Co. of Bethlehem, Pa., has been incorporated at Dover, Del., with a capital stock of \$15,000, the avowed purpose of the company being the building of steamships.

Capt. B. H. Spurling has contracted with W. Irving Adams of East Boothbay, Mass., for the construction of a schooner for use in Florida waters.

The New England Co. of Bath, Me., has just launched for the Consolidated Coal Co. of Baltimore a coal barge of 1,650 tons capacity.

SAVED A PART OF THE SHIP.

Swan & Hunter, well-known English ship builders, have launched the newly constructed fore end for the steamer Milwaukee. It will be remembered that the Milwaukee, a vessel of 483 feet length and 56 feet beam, went ashore near Aberdeen last September, a huge rock penetrating the hold for a length of 30 feet and to a height of 8 feet above the tank top. When the salvage operators saw that it would be impossible to save the entire vessel, it was decided to blow her in two with dynamite. This was done successfully and 180 feet of the fore end was left on the rocks, while the after end was towed to dry dock to be joined to the portion that has just been launched. The method resorted to in severing the vessel was by the application of successive charges of dynamite, each charge being spread over a length of from 4 feet to 6 feet, the charges being varied according to the thickness of the steel plates to be severed. So excellent was the quality of the steel that no less than 140 pounds of dynamite was required to burst the plates asunder in the spaces named. Eventually, the after portion of the huge steamer was detached and safely floated into deep water, the engines and boilers being thus preserved. The salvaged part of the vessel was towed to the Tyne and docked by the Wallsend Slipway & Engineering Company, whilst Messrs. C. S. Swan & Hunter, the builders of the vessel, were entrusted with the rebuilding of the forward and missing portion.

Announcement is made of the formal organization of the International Steam Pump Co., which it will be remembered comprises the Worthington, Blake, Knowles, Snow, Laidlaw-Dunn-Gordon and Deane companies. The new corporation is officered as follows:—President, Charles C. Worthington; first vice president, Marcus Stine; second vice president, J. W. Dunn; treasurer, Max Nathan; secretary, James H. Snow. Nothing has been given out regarding the plan for the disposal of the company's output, but it is understood that not more than one office will be located in any of the large cities. In short, districts will be allotted to the different component companies, the New York office being in charge of the Worthington company, the Boston office controlled by the Blake-Knowles interests and the Cleveland branch by the Laidlaw-Dunn-Gordon company.

Bids have been opened for supplying machine tools for the Boston navy yard. The bidders included the Garvin Machine Co., Spring and Varick streets, New York City; Niles Tool Works, Hamilton, O.; U. Baird Machinery Co., 123 Water street, Pittsburg, Pa.; N. E. Drew, Manchester, N. H.; S. A. Woods Machine Co., 445 Dorchester avenue, South Boston, Mass.; Hill, Clarke & Co., 156 Oliver street, Boston; New Jersey Foundry & Machine Co., 26 Cortlandt street, New York City; the Fairbanks Co., Broadway, New York City; Manning, Maxwell & Moore, 11 Liberty street, New York City; Cumberland, Dugan & Co., 20 South Charles street, Baltimore; Gould & Eberhardt, Newark, N. J.

In order to illustrate the wisdom of large expenditures for New York harbor improvements a statement has just been made up which affords an excellent idea of the growth of the business of the metropolis in the last 40 years. In 1862 the total receipts were valued at \$36,399,954.25. For the fiscal year ending July 1, 1898, the total receipts were \$103,703,355.40. In 1862 the total annual tonnage of vessels arriving was 2,509,749. In 1898 it was 7,761,412. In 1862 the number of employees in the custom house building was about 300. It is now 510, exclusive of the naval office force, which, owing to want of space, was moved into other premises in 1874.

The Nicopol Maripol Mining & Metallurgical Co. of Maripol, Russia, will erect a new slabbing mill in connection with its works, and has awarded to the Babcock & Wilcox Co. a contract for four 650 horse power boilers for the new mill, as well as another contract for four 550 horse power boilers to be operated in connection with blast furnaces. The new mill will be erected by the Morgan Engineering Co. of Alliance, O., and Manning, Maxwell & Moore of New York will furnish two electric cranes of 50 and 15 tons capacity respectively.

The Manistee Iron Works Co., Manistee, Mich., has completed an air pump that is said to be the largest independent air pump in the world, exceeding in size even that installed on the steamer Kaiser Wilhelm der Grosse. The steam cylinder of the Manistee pump is 20 inches in diameter by 72 inches stroke and the two air cylinders are each 42 inches in diameter by 36 inches stroke. The total weight of the pump is 60,000 pounds.

The Q. & C. Co. of Chicago is working its shops overtime and is ninety days behind on orders for machinery. Large shipments of pneumatic tools are being made to London, Paris and Russia.

AROUND THE GREAT LAKES.

Danaher & Cochrane have sold the steamer Marion to Samuel Neff of Milwaukee for \$30,000.

Thompson Brothers of Port Huron, have leased for wrecking work at the Sault the tug Vigilant owned by Loud & Sons of Oscoda.

Pickands, Mather & Co. of Cleveland, have purchased the Mikado mine near Bessemer, Mich., and will operate it as soon as the property can be unwatered. The mine has been idle since 1897.

The McNaughton Transportation Co. of Montreal has withdrawn its attachment suit against the fleet of lake vessels left at Valleyfield on the St. Lawrence, but the claim of the Donnelly Wrecking & Salvage Co. remains unsettled.

The excursion steamer Columbia, purchased some time ago by Hiram W. Sibley of Rochester, N. Y., is being converted into a steam yacht at Buffalo, and will probably be taken to the Atlantic coast next autumn. The hurricane deck has been removed, new tubular boilers fitted and two new deckhouses will be built.

When asked with regard to the report that Samuel F. Hodge & Co. of Detroit, and the Craig Ship Building Co. of Toledo would consolidate, President Harry S. Hodge of the former company stated that there was nothing more in the report now than during the four or five years that the rumor has been in circulation.

It is announced, notwithstanding the recent report of a board of government engineers adverse to the plans outlined for the power canal at Sault Ste. Marie, that work on the canal is to be resumed at once. One steam shovel, it is expected, will be placed in operation this week and several others will soon follow.

A Welland canal size steel steamer building for W. A. Hawgood and others of Cleveland, at the Lorain yard of the Cleveland Ship Building Co. will probably be launched on Saturday, May 13. It was at first proposed to name this vessel Eureka, but the name is not settled as yet. The steamer will very probably go to the coast.

Since last autumn the Detroit Ship Building Co. has finished repair work aggregating in value about \$165,000. Among the vessels that have been in dry dock during the winter are the Fayette Brown, City of Rome, Presley, Aurania, Forest City, Shenango No. 1, Selwyn Eddy, light-house tender Marigold and whaleback barge No. 105.

Capt. James Davidson, ship builder and ship owner of West Bay City, Mich., says that as soon as the weather will permit he will make a trip to the steamer Harlem, wrecked off Isle Royale, Lake Superior, last November, with a view to effecting her release and arranging for rebuilding her at West Bay City. There is little hope, however, that much of the vessel will be left.

The four American yachts that are to contest for the position of challenger for the Canada cup are nearing completion. The one for the Rochester Yacht club is building at Quincy, Mass., while those for members of the Chicago Yacht club are building at South Chicago, Ogdensburg, N. Y., and Muncie, Ind. A. G. Cuthbert is the builder of the boat under way at South Chicago.

Supt. Calder of the Detroit Ship Building Co., who looked after the construction of engines for the steel barge Aurania, predicts that she will prove this season the most economical freight carrier on the lakes. She is expected to maintain a uniform speed of 10 miles an hour. Mr. John Corrigan certainly has a cheap boat in a steamer of about 5,000 tons capacity that has cost him only \$150,000.

William W. Lindsay, a Detroit attorney, writes to Capt. George P. McKay, chairman of the aids to navigation committee of the Lake Carriers' Association, that he controls the patent rights on an automatic fog signal, which it is claimed will sound blasts continuously at intervals of ten minutes for six months. The further claim is made that the sound can easily be heard at a distance of two miles.

The past has been an exceptionally busy season at Oades's ship yard, Detroit. The yacht Pilot has received a new cabin, the yacht Nipigon has been rebuilt and general repairs have been made to the schooners Melburn, Angus Smith, Charles Hebard and Whittaker. Other work included the overhauling of the light-house tenders Haze and Marigold and the alteration of the yacht Louise from steam to sail.

The Buffalo Furnace Co., Buffalo, N. Y., is constructing a new dock 150 feet in length at its works for use in loading pig iron into vessels. The new dock will connect with the iron ore docks. The new Union Iron Works, which adjoins the property of the Buffalo Furnace Co., has a large force of men at work digging a slip which will enable boats to go into the Company's yard and unload close to the works.

Capt. William Rollo, one of the best known captains on the great lakes, died recently at his home in Port Huron from an attack of paralysis. He was born in Scotland, Feb. 23, 1829, began sailing at the age of seventeen and followed that occupation all his life. He was in the employ of the Ogdensburg Transit Co. for many years, sailing between Ogdensburg and Chicago, and his last request was that interment be made at Ogdensburg.

Major Clinton B. Sears, United States engineer at Duluth, on May 1 opened proposals for building a riprap embankment at Two Harbors, Minn. The lowest bid was \$26,520.49, submitted by Engle & Osman of Duluth. Other bidders were King & Steele, Duluth, \$37,247; Porter Bros., Duluth, \$36,379.99; Frank Campbell, Duluth, \$34,242.20; Butler-Ryan Co., St. Paul, \$61,974; Alexander Sang, Duluth, \$40,768.25; and Charles Stone, St. Paul, \$60,722.

The tow barge Aberdeen, of the Minch fleet, over which there is some difficulty with underwriters, will be offered for sale May 15 on a libel for \$1,875 salvage charges brought by the Crosby Transportation Co. of Milwaukee. The vessel was given up for lost after a storm in October last, but was finally picked up and towed into Grand Haven by the Crosby's company steamer Nyack. Difficulties with the underwriters followed, and the prosecution of the salvage claim results from both owners and insurers refusing to assume it.

After a year's suspension, work is to be resumed shortly on the construction of the concrete breakwater at Marquette. The structure is to be

3,000 feet in length. One-third of the work has been completed and it is expected that an additional 500 feet will be put in this summer, an appropriation of \$25,000 having become available for the purpose. The original estimate for the work was \$232,000 but present indications are that it will be possible to complete the breakwater with an expenditure that will be probably \$75,000 less than the figure noted.

Architect Mindeloff of the United States life saving service returned to Washington, a few days ago, after examining sites for new life saving stations at Sleeping Bear Point, South Manitou Island, at Charlevoix on Lake Michigan and at Grand Marais, Lake Superior. Mr. Mindeloff had made full surveys of the sites and Supt. Kimball of the life saving service instructed him to proceed at once with the plans and specifications, in order that work on the new stations may be begun at the earliest possible moment. It is estimated that the four stations will cost in the neighborhood of \$15,000.

A new elevator to be built for the Great Northern company at West Superior will be 250 and 370 feet in length, 100 feet wide and 232 feet in height. The present elevator A is 98 feet wide and 385 feet in length. The latter has a capacity of 2,000,000 bushels, while that of the new building will be 3,000,000 bushels. In the new elevator there will be 500 steel bins, each with a capacity of 6,000 bushels. It will cost \$1,250,000. Four thousand piles will be driven for the foundation and 21,000 cubic yards of earth will be excavated, for which latter work the bid of Schmidt Bros. of West Superior—\$85,000—was accepted.

Col. Jared A. Smith, United States engineer, has opened bids for dredging work in the harbor of Cleveland during the coming season, about \$70,000 having been appropriated for the purpose. The bids received were as follows: Buffalo Dredging Co., Buffalo, 19 cents per cubic yard; G. H. Breymann & Bros., Toledo, 13½ cents; Carlin, Stickney & Cram, Detroit, 19 cents; James Rooney, Toledo, 18 cents; Samuel C. Dixon, Milwaukee, 15 cents; the L. P. & J. A. Smith Co., Cleveland, 12¾ cents; and James Proyer, Houghton, Mich., 14½ cents per cubic yard. The bid of the Cleveland firm is the lowest.

Vessels of the Wilson Transit Co., Cleveland, that have been engaged during the past two years as a lake line for the Wisconsin Central Ry. between Manitowoc and Buffalo, connecting at the latter port with the Lehigh Valley and Lackawanna, will be operated entirely this year by the owners, who will be represented by E. S. Lord as local agent at Manitowoc, and W. J. Stewart as local agent at Buffalo. Mr. Geo. W. Bone will also be connected with the Buffalo office, which will be in the Ellicott Square building. Vessels of the line will be the Olympia, Tower and Spokane, with the Wallula as an extra steamer to fill in when required.

P. H. Studer, Detroit boat builder, is at work on a launch, which in the matter of projecting snout and protected rudder, as well as in outline of hull, will be modeled after the battleship Texas, the proportions being the same on a reduced scale. The launch will be 25½ feet in length, 6 feet 6 inches beam and 5 feet 6 inches depth, and will be utilized for patrol duty in the Sault river. She will be equipped with a 12 horse power Superior gas engine and will cost \$1,900. Mr. Studer also has an order to build for M. M. Sullivan a launch of 45 feet length and 6 feet beam and which is to develop a speed of 15 miles. The cost of the boat will be \$2,100.

In a letter to Capt. George P. McKay of the Lake Carriers' Association, Commander C. O. Allibone, U. S. N., inspector of the ninth light-house district, with headquarters at Chicago, states that he has been at the north end of Lake Michigan placing buoys, and that while the ice has delayed work with the buoys in the Straits they will soon all be in position. While at Charlevoix, he says, he secured promises from the captains of fishing tugs who will be at work on Lansing shoal to keep a sharp lookout for obstructions. Commander Allibone states further that he will make a complete survey of the locality and will also recommend to the light-house board that a complete survey of the lake be made. He also promises to take up with the light-house board the matter of moving the light vessel now on Simmons' reef.

"THE LITTLE RED BOOK."

By accident the above name was given to a vest-pocket directory of owners and officers of lake vessels. For several years past the Marine Review Publishing Co. has collected and arranged in handy form for reference the appointments of captains and engineers of lake vessels. No name was especially selected for the first issue of this list. It happened to be bound in a red cover. It became popular at the outset on account of its value to everybody having dealings with vessels or the owners of vessels on the great lakes. It was a little red book and everybody referred to it by that name. The name was adopted and placed on the cover of the book. Now there is inquiry each year for hundreds of copies of the "Little Red Book" long before the list is completed. The 1899 issue is just off the press. This list shows at a glance the name of owner, captain and engineer of any lake vessel. It is also a collection of ship owners with their post office address. It sells at \$1.

The Harlan & Hollingsworth Co., Wilmington, Del., announces that it has taken new offices in the Exchange Court building, 52 Broadway, New York City, and that its representatives in the metropolis have removed thereto from the Boreel building where they have been located for the past fourteen years. Mr. Richard Deming, New York agent of the company, will be pleased to see his friends at the new quarters.

The handsome tug Fearless, just completed by the Union Iron Works, San Francisco, for John D. Spreckels Bros. & Co. of that city had a most successful trial a few days since. She more than fulfilled all expectations of both owners and builders, maintaining a speed of 12.4 knots.

Reports from Russia state that the ice-breaking steamer Ermack, constructed for the Russian government in England, succeeded in opening the port of Reval, plowing through ice ranging from 16 to 18 feet in thickness. In four days she released sixteen vessels that had been imprisoned in the ice.

LIFE SAVING SERVICE.

ANNUAL REPORT OF THE UNITED STATES ESTABLISHMENT WHICH OPERATES
264 STATIONS—NUMBER OF DISASTERS, LIVES AND PROPERTY SAVED, ETC.

Seldom if ever has an annual report of the United States life saving service shown a greater or more creditable array of accomplishments than that embraced in the report just issued by Supt. Kimball, for the fiscal year ended June 30, 1898. The report shows that there were 264 stations embraced in the life saving establishment at the close of the fiscal year. Of this number, 192 were situated on the Atlantic and gulf coasts, fifty-six on the coasts of the great lakes, fifteen on the Pacific coast, and one at the falls of the Ohio, Louisville, Kentucky.

The number of stations located in each of the several districts was as follows: First district (coasts of Maine and New Hampshire), 13; second district (coast of Massachusetts), 29; third district (coasts of Rhode Island and Long Island), 40; fourth district (coast of New Jersey), 42; fifth district (coast from Cape Henlopen to Cape Charles), 18; sixth district (coast from Cape Henry to Cape Fear River), 31; seventh district (coasts of South Carolina, Georgia, and eastern Florida), 11; eighth district (Gulf coast), 8; ninth district (Lakes Erie and Ontario, including Louisville station), 12; tenth district (Lakes Huron and Superior), 17; eleventh district (Lake Michigan), 28; twelfth district (Pacific coast), 15; total, 264.

Reports of the several district officers show 402 disasters to documented vessels within the field of life saving operations during the year. The number of persons on board these vessels was 3,113, of whom only twelve were lost. The estimated value of the vessels was \$5,861,320 and that of their cargoes \$1,307,070, making the total value of property imperiled \$7,168,390. Of this amount \$6,410,530 was saved and \$757,860 lost. The number of vessels totally lost was fifty-nine. There were also 365 casualties to undocumented craft—sailboats, rowboats, etc.—carrying 874 persons, ten of whom perished. The value of property involved in these instances is estimated at \$199,705, of which \$177,825 was saved and \$21,880 lost. Six hundred and sixty-three persons received succor at the stations, the number of days' relief furnished aggregating 1,328. The total number of disasters, 767, exceeds that of the preceding year by sixty-eight and is the largest number reported in the history of the service, while the loss of life is considerably less in proportion to the number of disasters than in any previous year.

Results of disasters to vessels of all descriptions within the scope of the service are as follows: Total number of disasters, 767; total value of property involved, \$7,368,095; total value of property saved, \$6,588,355; total value of property lost, \$779,740; total number of persons involved, 3,987; total number of persons lost, 22; total number of shipwrecked persons succored at stations, 663; total numbers of days' succor afforded, 1,328; number of vessels totally lost, 59.

The apportionment of the foregoing statistics to the Atlantic, lake and Pacific coasts, respectively, is shown in the following table:

	Atlantic and Gulf coasts.	Lake coasts.	Pacific coast.	Total.
Total number of disasters.....	500	243	24	767
Total value of vessels.....	\$3,678,735	\$2,168,815	\$207,345	\$6,054,895
Total value of cargoes.....	\$858,345	\$428,290	\$26,565	\$1,313,200
Total amount of property involved.....	\$4,537,080	\$2,597,105	\$233,910	\$7,368,095
Total amount of property saved.....	\$4,088,570	\$2,344,240	\$155,545	\$6,588,355
Total amount of property lost.....	\$448,510	\$252,865	\$78,365	\$779,740
Total number of persons on board.....	2,698	1,149	140	3,987
Total number of persons lost.....	14	7	1	22
Number of shipwrecked persons succored at stations.....	510	109	44	663
Total number of days' succor afforded.....	1,130	121	77	1,328
Number of disasters involving total loss of vessels.....	48	9	2	59

In 577 instances vessels were worked off when stranded, repaired when damaged, piloted out of dangerous places, and similarly assisted by the station crews. Besides the foregoing, assistance of minor importance was rendered to 324 vessels and small craft. There were also 226 instances where vessels running into danger of stranding were warned off by the signals of the patrols.

Following is a general summary of disasters that have occurred within the scope of life saving operations from Nov. 1, 1871 (date of introduction of present system), to close of fiscal year ending June 30, 1898: Total number of disasters, 10,448; total value of vessels, \$113,346,275; total value of cargoes, \$47,839,149; total value of property involved, \$161,185,424; total value of property saved, \$125,630,262; total value of property lost, \$35,555,162; total number of persons involved, 81,245; total number of lives lost, 845; total number of persons succored, 13,876; total number of days' succor afforded, 35,199.

It is probable that the navy department will bid on the steel floating dock at Havana, if it is put on sale at auction by the Spanish authorities. After the ownership of the dock was conceded to the Spanish government, on the ground that it was a movable effect, the authorities here offered \$275,000 for it. The offer has not been accepted, and the report that the dock would be auctioned is taken as a rejection of the \$275,000 proposition. The need of the dock is somewhat offset by the recent government purchase of a small floating dock at New York, capable of docking a 2,500 ton vessel, and also by the building of a large dock at Algiers, near New Orleans. The small dock now at New York will be towed to Pensacola at an early day, so that with the Algiers dock the navy department will have two docks available on the gulf.

Ten days stop-over at Washington—Tickets to Philadelphia and New York over Pennsylvania short lines may be obtained via Washington, and good for a ten days' visit at the national capital, at the same fare as apply to Philadelphia and New York over direct lines of Pennsylvania system. For further particulars apply to Pennsylvania lines ticket agents or address C. L. Kimball, passenger agent, Cleveland, O.

PROGRESS IN SHIP DESIGN.

DEVELOPMENTS OF THE PAST AND THE POSSIBILITIES OF IMPROVEMENT LEFT
FOR THE NEXT CENTURY ARE DISCUSSED BY CHIEF NAVAL CONSTRUCTOR
HICHBORN—ELECTRICITY THE MOST IMPORTANT FACTOR.

The position at present occupied by the United States as the second of the maritime powers in point of war vessels under construction has naturally attracted the attention of the whole world to the influences that have brought about such a condition and to the facilities that have made it possible. No student of naval affairs can fail to realize that the attainment of such a position by the United States has been brought about by a most varied series of circumstances, the interest and instruction embodied in which has been well preserved throughout the entire length of an article which Chief Constructor Hichborn of the bureau of construction and repair, navy department, recently contributed to the Saturday Evening Post. Referring to the progress thus far made with electricity in vessels of war, and to the strides of a few years in armor plate, and speculating somewhat on the possibilities of improvement left for the next century, Mr. Hichborn says:

"We can see that our progress in design of naval vessels has not been a gradually uniform progression, but that, on the contrary, it has moved in epochs, if it may be so described. The introduction of electric power in our vessels of war for other than lighting purposes is of comparatively recent date, but it bids fair to be an important factor in new ship design. Its use so far in displacing steam power for the operation of turrets, hoists, winches, boat cranes, ventilating fans and other auxiliary machinery has given such general satisfaction, owing to freedom from noise, heat and the other ills inherent in steam power, that its more general application is assured. And, in fact, the suggestion of the use of electricity, liquified air, or perhaps some other at present unknown power for the propulsion of ships in the next century is not so chimerical in the light of the wonders of the nineteenth century, as may at first appear. From the use of railway iron and boiler iron in the early sixties, to compound iron and steel armor of the following decade, manufactured abroad, and face-hardened steel armor, now manufactured in this country, is an advancement which seems most too prodigious for so short a period; but even now we have in contemplation the adoption of a process of face-hardening which will produce plates equal to armor made by the present method of manufacture and still be about one-fifth less in thickness. Even to one unversed in naval construction the great advantages of this improvement will be obvious, affording as it does a greater protection on a specified weight of armor, or with the same protection allowed for the vessels now under construction permitting of a wider distribution of armor, or greater allowance of weight for machinery or other purposes.

"The battleship of the present is a compromise of the contentions for speed, armament and protection. On a given displacement, undue allotment of weight for either of these purposes means a sacrifice of either of the others. The balancing of these to a nicety results in a vessel of the greatest efficiency. The limit of reduction of weight of machinery, armament and armor seems to have been practically reached, and it only remains to be seen whether by radical changes the efficiency of the man-of-war of the future can be increased. There would appear to be some expectation in this direction from the use of smokeless powder, either in diminishing the amount of space and weight required or in effecting more power in the gun; from the use of improved armor, by lessening the weight to be carried or affording greater protection; and from the application of electricity to all auxiliary machinery on shipboard. The latter is quite an important item, and would result in many advantages, as well as a greater efficiency, and this can be better understood from the statement that on some vessels no less than four different powers are utilized, namely, electric, steam, hydraulic and pneumatic. Surely there are some possibilities of improvement left for the next century, if only in the adoption of a single motive power.

DEVELOPMENT OF THE STEEL CAR.

In the development of the steel car of large capacity, which is certain to shortly replace entirely the type of wooden car known by the name gondola, especially on railways carrying large quantities of coal and iron ore, the railway officials are introducing many new features that were not thought of in the original designs. Some of the latest improvements are noted in a type of 80,000 pounds capacity drop bottom coal car designed by A. M. Waitt, general master car builder of the Lake Shore railroad. About 500 cars of this kind are now building for the Lake Shore road and an equal number for the Pittsburgh & Lake Erie road. The cars are 35 feet in length over the end sills and 9 feet 3 inches wide over the side sills, while the corresponding inside measurements are 33 feet 6 inches and 8 feet 9 inches, and the sides are 4 feet 5½ inches in height. The floor is level and has four openings for drop doors, 2 feet 10 inches long by 2 feet wide. Each door is made of a double thickness of tongue and groove plank and hinged so as to be flush with the floor when closed. The doors are closed in the usual manner by winding up chains, two doors being operated from one winding shaft. When closed each door is held in place by a malleable iron latch. Turnbuckles for these cars are of wrought iron, made by Cleveland City Forge & Iron Co.

In the recently issued annual report of Canada's department of railways and canals, Mr. Collingwood Schreiber, deputy minister, says: "It has to be observed that the chief engineer lays emphasis on the fact that although the dimensions of the enlarged locks are 270 feet length, 45 feet width and 14 feet of water on the sill, the length of the vessels to be accommodated is limited to 255 feet." This reference is, of course, to the St. Lawrence canals, which it is stated in another portion of the report will in all probability be ready for use some time during 1899.

The general assembly of the Presbyterian church holds its annual meeting at Minneapolis, Minn., May 18 to June 1. Agents of the Nickel Plate road are authorized to sell excursion tickets at low rates on May 15, 16 and 17.

28 May 11.

GOVERNMENT CABLE SHIP.

THE STEAMER HOOKER SELECTED TO LAY CABLES BETWEEN THE PHILIPPINE ISLANDS, IS NOW FITTING OUT AT MORSE'S SHIP YARD, SOUTH BROOKLYN, N. Y.

A vessel that will be known officially as the United States cable ship Hooker is now refitting at Morse's ship yard, South Brooklyn, N. Y. Previous to her selection for the service of laying cables between the Philippine islands she was the transport Hooker and her history prior to her use in that capacity was also interesting. Built in England several years ago, she was at the outbreak of the Spanish-American war in the service of the Compania Transatlantica Espanola as the passenger steamer Panama. The United States auxiliary cruiser Mangrove captured her after a hard chase and she thereafter served as a regular transport ship, her name being changed to Hooker. She is 333 feet over all, 33 feet beam, of about 2,000 tons burden and fitted with a 1,600 horse power engine, working a single screw, which is expected to drive the vessel at a speed of 13 knots.

Her adaptability from various standpoints prompted the selection of the Hooker as the first cable ship to be attached to the United States navy. Alterations made in the vessel are of a most extensive character. The forecastle has been heightened about 6 feet, giving her a higher free-board forward, and on top of this forecastle are mounted two Hotchkiss six-pounder rapid-fire guns for use in the pirate infested seas which the vessel will be obliged to traverse in the accomplishment of the work of connecting the various islands of the Philippine group by cables. All of the interior fittings of the ship were also removed and three tanks for cables installed, as well as refrigerating rooms and appliances for the transportation of fresh meat. The forward cable tank is 13 feet in diameter and 8 feet in height and will have a capacity of 60 tons of cable. The tank amidships is 24 by 13 feet and has a capacity of 400 tons, while the after tank is 26 feet in diameter by 6 feet deep and will hold 240 tons, the total capacity thus aggregating 700 tons of cable. The tanks are circular and slightly conical in shape and are built of boiler iron with calked joints, so as to be watertight.

The cable when coiled in place is covered with sea water, partially for the purpose of providing a continuous outside connection for the testing circuits and partly in order to preserve the cable, gutta-percha which is used as the insulator deteriorating rapidly when exposed to the air. On the main deck forward is installed a winding gear, consisting of a drum about 8 feet in diameter supplied with brakes and the usual accessories for cable work. The cable is paid out over a boom in the bows, carrying a pulley at its end. Under the pilot house is the cable testing room. The refrigerating plant is capable of accommodating 150 quarters of beef. The old electric light plant has been removed and replaced by a new one, the dynamo being connected to a Buffalo Forge Co. engine. The Vance Electric Co. of New York installed the plant, which includes two search-lights.

OPENING OF NAVIGATION—FIRST SHIPS.

The past week has seen a general opening of navigation on the great lakes. Before this issue of the Review is in the hands of its readers all ports, with the possible exception of those on the north shore of Lake Superior, will be open and the regular traffic of the season will be in full progress. The opening was devoid of any unusual features beyond the fact that exceptionally warm weather caused the ice to break up rather more rapidly than had been anticipated and in consequence a general movement of the ships came several days sooner than had been predicted in some quarters. The steamer Ferdinand Schlessinger, bound for Milwaukee with a cargo of coal from Lake Erie, opened navigation in the Straits of Mackinaw at 8.20 o'clock on the evening of April 26. The running time of the Schlessinger from Port Huron to Mackinaw City was in the neighborhood of twenty-four hours. The steamer Neosho was the second boat to pass up. She got through at 10.30 o'clock the same evening, followed by the steamer Vega at 1 o'clock the next morning and the Fletcher at 4.15 o'clock. The steamers W. R. Linn and Geo. W. Roby, first of the down-bound fleet, passed through the Straits at 8.40 o'clock in the morning of April 27. The Linn also led the grain fleet into Buffalo, arriving there during the afternoon of April 29 and beating the Roby by an hour. Navigation through the St. Mary's river to Lake Superior was opened April 29 by the steamer Waldo, which passed the Sault at 3 o'clock in the afternoon, although the Livingston, which arrived at noon but was delayed for repairs, was the first boat up. The Waldo was also the first vessel to reach Duluth. She made that port on the morning of May 1, but was delayed several hours in ice outside the harbor. The Livingston arrived at Ashland on the evening of the same day. The first ore cargo, that of the steamer E. C. Pope, reached Cleveland May 1. Last year the first ore cargo reached one of the Ohio ports April 19. The Welland canal opened April 24 when the steamer Ralph and consort Harold passed down.

According to the latest reports that have reached the bureau of construction, navy department, excellent progress is being made on the various naval vessels now building for the United States government. Two and possibly three new battleships will be ready to go into service before the close of the present year and an equal number are likely to follow in the first half of 1900. The Kearsarge and Kentucky, building at Newport News, are seven-eighths completed, while four-fifths of the work on the Alabama at the Cramp yard, Philadelphia, has been done. The cruiser Albany, sister vessel of the New Orleans, building by the Armstrongs of Elswick, England, is also four-fifths completed, while the battleships Illinois and Wisconsin, building by the Newport News Co. and the Union Iron Works, San Francisco, respectively, are 65 per cent completed. The torpedo boats Dahlgreen and Craven at Bath, Me., are about 90 per cent completed and the Stringham, building by the Harlan & Hollingsworth Co. at Wilmington, Del., is just at the launching stage.

The navy department has completed arrangements to dock the cruiser San Francisco for repairs at the Brooklyn navy yard.

SOME POWERFUL DREDGES.

Maj. James B. Quinn, United States engineer in charge of government work at the mouth of the Mississippi river, has designed two powerful suction dredges to be used in maintaining the channel at South Pass. They will cost in the neighborhood of \$150,000 each and will be about 157 feet in length, 37 feet beam and 16 feet depth of hold, with two propellers and a hopper capacity of 650 cubic yards. Two centrifugal pumps, with 15 and 18-inch suction pipes about 60 feet in length, will be suspended along side the hull. Judging from the showing made by the dredge Reliance, on the lines of which the new dredges are modeled, the average rate per minute of each will be 12.03 cubic yards. The new boats will be fitted with shore discharge pipes to deposit material over the levees. John Stewart & Son, Ltd., of Blackwall, England, recently completed a powerful twin-screw suction hopper dredge for the Russian government. This boat is 184 feet in length, 33 feet beam and 14 feet depth. The loading capacity of the hopper is 500 tons and with this load the vessel draws 11 feet 11 inches, and is capable of maintaining a speed of 8 knots per hour. The hull is divided by ten bulkheads. Arrangements are provided by which the dredgings may be discharged into the dredger's own hopper wells, or into barges alongside, or on to the shore by means of tubes, the necessary steam winches and a derrick being fitted for manipulating the suction pipes, and opening and closing the hopper doors. The crew spaces are steam-heated, and the ship is fitted throughout with electric light, a search-light projector being carried on the bridge. The dredging apparatus consists of two powerful centrifugal pumps, driven from the fore ends of the crank shafts of the propelling engines by clutch gearing, the suction pipe being jointed to the ship's side, and so arranged that at any required time the pipe can be raised above water and placed on deck. The top of the pumps communicate with two delivery pipes arranged to deliver the dredged material either in the well or in barges alongside or ashore. The delivery pipes along the well have doors which can be opened or shut to distribute the load in the well as desired. The propelling machinery consists of two sets of compound surface-condensing engines of 600 horse power combined, the diameter of the cylinders being 14 inches and 30 inches, and the stroke 22 inches. Steam is supplied by two boilers, each 11 feet diameter and 10 feet 6 inches long, having two furnaces in each, with separate combustion chamber. The working pressure is 120 pounds per square inch. An auxiliary boiler, fitted for providing steam for working the dynamo and steam heating, is also provided.

The William Price hopper dredge, lately built by Wm. Simons & Co. of Renfrew, Scotland, for the Karachi Port Trust, of India, has the following general dimensions: Length, 236 feet; beam, 42 feet 6 inches; depth of hold, 16 feet; hopper capacity, 1,250 tons. This dredge is propelled by two sets of triple expansion engines, of about 1,500 horse power, and her loaded speed is 10 knots. The dredging is done by an endless chain of buckets working through a central well, with the usual steel-framed tower at the movable end of the dredge-ladder, for graduating the position of this ladder to the work to be done.

Mr. George W. Dickie, superintendent of the Union Iron Works, San Francisco, concludes in the current number of the Engineering Magazine his very interesting article on "The Monitor, the Battleship, the Cruiser and the Destroyer." In discussing the third mentioned type of vessel he says: "I believe that the armored cruiser and the battleship will in the near future merge into each other, the result being a vessel having the best qualities of both. I think that in action the new high-powered cruisers, fitted with water tube boilers, will be in danger from the number of smoke pipes, usually four, the shooting down of any of which would interfere seriously with the working of the guns and ammunition service." In his comments on the torpedo boat destroyer Mr. Dickie says: "I have some doubt as to whether this type of vessel has been properly named. It depends upon the meaning attached to the word boat. If the meaning is a torpedo boat intended to destroy other torpedo boats, the name is not so terrible. But if it means a torpedo boat whose business is destruction in general, then the name accounts for the dread that great war ships have had of them. The United States had no boat of this class during the late war, and, although the Spanish had some that were considered very good, they evidently lacked the skill or courage to use them, so that nothing has been learned as to value, either for offence or defence of this type of fighting machine."

The example set by the United States during the Spanish-American war in fitting out an ambulance ship has been followed in the Austrian navy, for which there has been constructed an ambulance vessel to be known as the Graf Falkenhayn after the first president of the Austrian Red Cross society. This association has been entrusted with the care of the ambulance ship by the donor, Baron von Reinelt, who has also devoted a sum of 50,000 florins for its maintenance in time of peace. The new steamer, which has an estimated speed of 9 knots, has an isolated wing for infectious cases and two bath rooms, and, in short, is provided with all modern hygienic requirements. Its equipment, which is now complete, includes four life boats and two disjointable rafts.

J. P. Holland, inventor of the Holland submarine boat, has returned from England. His failure to interest the British admiralty in the purchase of his invention was due, it is claimed, to an objection on the part of the British government to the principle of submarine boats rather than against Mr. Holland's specific system. Capt. Jacques, who is associated with Mr. Holland is now in Russia, and it is understood that he will offer the Holland boat to officials of the czar's government.

The topographical model of the Chicago drainage canal to be exhibited at the Paris exposition will be constructed by Edwin Howells, of Washington, D. C. The model, which will cost \$3,500, will be on a scale of 7 inches to the mile, and will show the canal in detail from Lake Michigan to Joliet.

Low rates to Minneapolis will be in effect May 15, 16 and 17 via the Nickel Plate road for the annual meeting of the Presbyterian general assembly. Tickets good returning until June 3. 30 May 11.

WHERE THE REVIEW IS FOR SALE.

The exigencies of the season of navigation force many readers of the Marine Review to depend upon the news stands for their copies of the paper from week to week. Special agencies have therefore been established in all the large cities, where the latest issue of the paper is always to be had and where subscriptions or advertisements for the liner columns may be entered at the regular rates. Agencies thus far established are: Mosses Dryfoos, Erie, Pa.; Lundberg & Stone, 223 West Superior street, Duluth, Minn.; Geo. L. Wilton News Co., West Bay City, Mich.; Geo. W. Wirts, 2 Ohio street, Buffalo, N. Y.; H. M. Johnson, 433 Tower avenue, West Superior, Wis.; Russell Bros., 804 Tower avenue, West Superior, Wis.; Bennett & Co., 214 West Superior street, Duluth, Minn.; Post Office News Co., Dearborn street, Chicago, Ill.; Crossley Bros., Newport News, Va.; J. E. Ray, 460 Detroit street, Cleveland; J. H. Officer, 2207 Richmond street, Philadelphia; Wolverine News Co., 72 Congress street, Detroit; H. L. Humphrey, Paine avenue and Front street, East Toledo, O.; D. Geiger, 9919 Ewing avenue, South Chicago; O. L. Mead, Lorain, O.; John P. McKenna, 151 Yonge street, Toronto, Ont.; K. H. Hubbard, 508 Water street, Port Huron, Mich.; J. P. Haller, 84 Ashmun street, Sault Ste. Marie, Mich.; Chas. McFadden, 375 Reed street, Milwaukee, Wis.

The trouble among grain shovellers at Buffalo will be fully settled by the stand which the Lake Carriers' Association has taken in support of the contractor, W. J. Conners. The position of the vessel owners is, in a few words, that the contractor is expected to treat with the men on the basis of last year's wages. He has promised to do this and the ship owners have full confidence in him. The Buffalo trouble, which now seems well at an end, is thus summed up by a representative of the Lake Carriers who has been in close touch with the situation: "The first reports about Conners trying to make \$200,000 on the season's grain receipts at Buffalo by paying the men by the hour and reducing the number of shovellers, were greatly exaggerated. The new arrangement which he proposed might have been to his advantage, but it is certain that the main cause of the trouble was the effort of labor agitators and the saloon bosses to overthrow or at least create trouble for the present contract system, which is not to their liking but highly satisfactory to the vessel owners. Whether the contractor was or was not trying to secure an advantage by having the men work by the hour it is certain that when called upon to do so he announced a willingness to treat the men entirely on the basis of last year's dealings with them, and when he did this there was nothing for the vessel owners to do but uphold him."

The revenue cutter Manning has been ordered to New York City for repairs to her hull frames in the neighborhood of the boilers. A recent examination disclosed the fact that a number of the main frames are bent and it is supposed that this damage was done during the recent cruise of the vessel in the inside waters of south Cuba.

Bement, Miles & Co. of Philadelphia have secured from the Carnegie Steel Co. a large order for lathes for the new axle manufacturing plant of the big steel concern. The Philadelphia firm is also making some shipments of very large gun lathes to England and Russia.

An unusual sight was witnessed at Belfast, Ireland, some days ago when there were in port vessels aggregating 109,430 tons, of which 70,680 tons was represented by ships undergoing repairs or fitting out at the Harland & Wolff plant.

A story has been in circulation in the east during the past week to the effect that Vickers' Sons & Maxim of England are negotiating for the formation of an alliance with the Wm. Cramp & Son Ship & Engine Building Co. of Philadelphia.

Inquire of agents of the Nickel Plate road about dates of sale, time of trains, connections and routes to San Francisco, Cal., for the National Baptist Anniversaries, May 26 to 30. One fare for the round trip.

23, May 11.

DROP FORGINGS TO ORDER

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1,000 tons lift in stock. Low rental or share of salvage. Belting, Hose, Packing, full line of best rubber at factory prices.

MINERALIZED RUBBER CO., N. Y.

For Sale—Two Boilers.

Two new Scotch Boilers, 12 ft. 6 in. diameter, 12 ft. long, with three 40-inch corrugated furnaces, built under Marine Inspection Laws for 130 lbs. pressure. Specifications and blue prints furnished on application. CAMPBELL & ZELL COMPANY, Manfr's Zell Improved Water Tube Boiler, Baltimore, Md. May 4

MANNING, MAXWELL & MOORE IN NEW QUARTERS.

The firm of Manning, Maxwell & Moore, and its kindred interests, the Ashcroft Manufacturing Co., the Shaw Electric Crane Co., the Consolidated Safety Valve Co., the Pedrick & Ayer Co. and the Hayden & Derby Manufacturing Co., whose New York offices and salesrooms have been located a great many years at Nos. 111 and 113 Liberty street, has removed to the new Singer building, 85, 87 and 89 Liberty street, corner of Broadway. The change has been found necessary owing to the steady increase of business done by the firm. The new quarters are large, commodious and convenient and arranged to meet the situation fully. The ground floor will be devoted to show rooms and has facilities for carrying a complete stock of everything pertaining to the business. The first floor will be occupied entirely by the business offices, which are complete in every detail, being fitted throughout with the most modern appliances to enable the large volume of business transacted to be carried on most economically, conveniently and expeditiously. Of special interest in this connection is the establishment of a central telephone desk or exchange which will give the firm direct telephone connection with all of its factories and with every department of the business.

Probably a more remarkable collection of testimonials has never been compiled than that presented in a small pamphlet issued by the proprietors of Bertram's Oil Polish, which is termed "the marine polish of the world." This polish serves as a cleaning and polishing compound for brass and all bright metals and contains no acid or other ingredient injurious to the surface to which it may be applied. It is especially adapted to marine engines, and for all manner of polishing work on yachts and steamboats, and is endorsed by many chief engineers of the United States navy as well as firms like the Gas Engine & Power Co. of New York. The committee of engineers which recommended its use by the bureau of steam engineering, navy department, said in their report: "We find it is a liquid compound resembling a mixture of Bristol brick and oil. We have tested it in competition with a mixture of Bristol brick and oil, and also in competition with another mixture of rottenstone and oil, and found it superior to them in producing the desired effect. It rapidly and with little labor restores a fine polish to discolored brass, copper and nickel-plated surfaces, and this polish is well retained. It has no disadvantages that we have been able to discover. We therefore recommend it for purchase and use for purposes under cognizance of the bureau of steam engineering."

Daughters of the Confederacy of Virginia will erect at Richmond a unique memorial to Admiral Franklin Buchanan of the Confederate navy. The memorial is a section of propeller shafting from the Confederate ram Merrimac. Is 14½ inches in diameter and 27½ feet long.

William Sellers & Co., Philadelphia, have secured an order for a floor boring machine of very large capacity from Henry G. Morse for use in the new ship yard which he will shortly establish. They report business fully up to the heavy standard maintained during the past six months.

The Union Iron Works, San Francisco, has awarded to the Cleveland City Forge & Iron Co. the contract for engine forgings, rudder and stern frame forgings for the steamers to be built for Hawaiian service.

Davis Bros. Mfg. Co. of Milwaukee lately installed a complete equipment of pneumatic tools, consisting of a Curtis compressor and Boyer hammers, riveters, etc.

A visit to the national capital may be enjoyed without extra cost for fare in going to Philadelphia and New York over Pennsylvania short lines. Tickets to those points via Washington may be obtained at same fares as apply over Pennsylvania direct lines, and will be good for ten days' sojourn at the national capital. For particular information apply to Pennsylvania lines ticket agents or address C. L. Kimball, assistant general passenger agent, Cleveland.

JAMES MCKAY & CO.

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Lv Port Tampa 9 00 p m Mon Thurs & Sat.	Lv Havana 12 30 p m Wed Sat & Mon.
Ar Key West 3 00 p m Tues Fri & Sun.	Ar Key West 7 30 p m Wed Sat & Mon.
Lv Key West 9 00 p m Tues Fri & Sun.	Lv Key West 9 30 p m Wed Sat & Mon.
Ar Havana 6 00 a m Wed Sat & Mon.	Ar Port Tampa 2 30 p m Thurs Sun & Tues.

Fast passenger trains between the East, North and West and Port Tampa, where direct connection is made at ships side with steamers of the Plant Line. For information as to rates, etc., apply to

G. LAWTON CHILDS & CO., Agents, 22 Mercaderes, Havana, Cuba.
W. V. LIFSEY, Division Passenger Agent, Tampa, Florida.
J. J. FARNSWORTH, Eastern Passenger Agent, 261 Broadway, N. Y.

H. B. PLANT, Manager, NEW YORK.	M. F. PLANT, Asst. Mgr., NEW YORK.	B. W. WRENN, Pass'gr Traffic Mgr., SAVANNAH, GA.
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The steam yacht Niagara came out in J. N. Robins' Erie Basin dry dock, New York, a few days ago and was coated with the Rahtjens American composition, preparatory to leaving for her long cruise abroad. This vessel is expected to sail May 2 to be absent until the fall. She will visit the Azores and various ports of England, Scotland, and Norway, returning in time to witness the international yacht races. The steamship Excelsior was also out in the same dry dock last week. This vessel had not been docked before in seventeen months, in consequence of her owners being short of ships and obliged to keep them running continuously. The Excelsior's bottom was in first-class condition notwithstanding the extraordinary length of time since she was last docked. She was also recoated with the Rahtjens American composition.—Marine Journal.

Mr. Goshen, first lord of the British admiralty, has issued a statement to the effect that the announcement of the withdrawal of government subsidies from the Cunard, White Star and other lines is indicative simply of a desire on the part of the government to revise existing conditions and not with any intention of abandoning the subsidy policy.

Contracts have been awarded for the various improvements to be made at the Mare island navy yard, California. The Brown Hoisting & Conveying Machine Co. of Cleveland will furnish the handling machinery; Healy & Tibbits of San Francisco, Cal., will build the new quay wall, and the San Francisco Bridge Co. will lay a pipe line about a mile in length.

S. F. Hodge & Co., Detroit, Mich., have the contract for two 1,200 horse power triple expansion engines to be fitted in vessels designed for service on the Atlantic. Work has also just been started on a 1,000 horse power compound engine for a grain elevator at Duluth.

A dispatch from Newport News, Va., states that the steamers Kam-bira and Kings County have arrived there from Rio Janeiro, Brazil, each with a cargo of 1,500 tons of manganese ore, which is being shipped to the Carnegie company at Pittsburg.

Capt. J. G. Warren, corps of army engineers, Milwaukee, gives notice that a light-ship has been replaced at the south end of the unfinished breakwater, Milwaukee bay, at the expense of the engineer department.

Messrs. Taylor & Lang, Norfolk, Va., have recently completed a very creditable piece of work in the rebuilding of the tug Bentley, formerly the James Simpson, which plied on the James river.

One fare for the round trip.—The National Baptist Anniversaries will be held at San Francisco, Cal., May 26 to 30. Agents of the Nickel Plate road are in possession of complete information in regard to rates, dates of sale, routes, and time of trains, and will be glad to furnish some to all contemplating a trip to the coast at low rates.
24, May 11.

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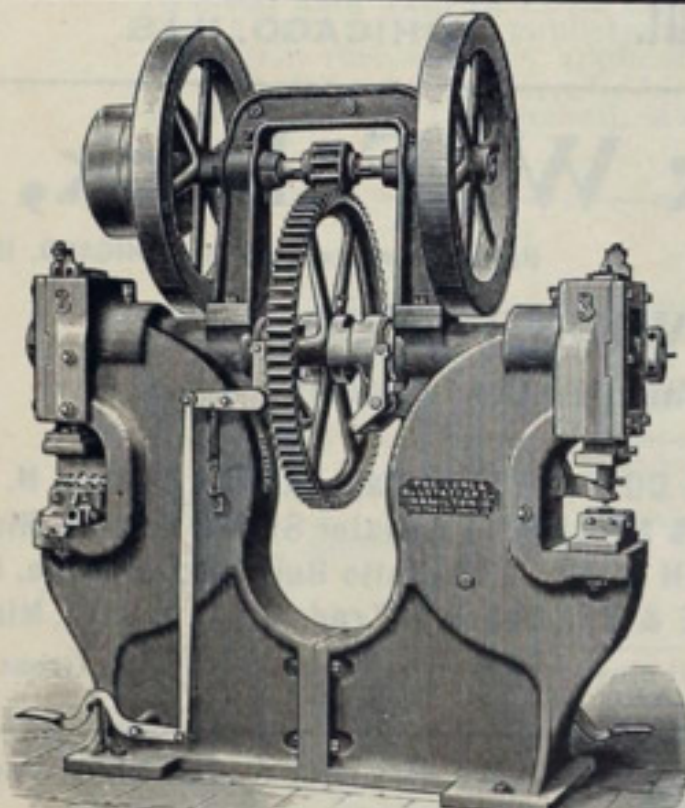
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PLUMBAGO
HEART
HOISTING
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CARGO FALLS



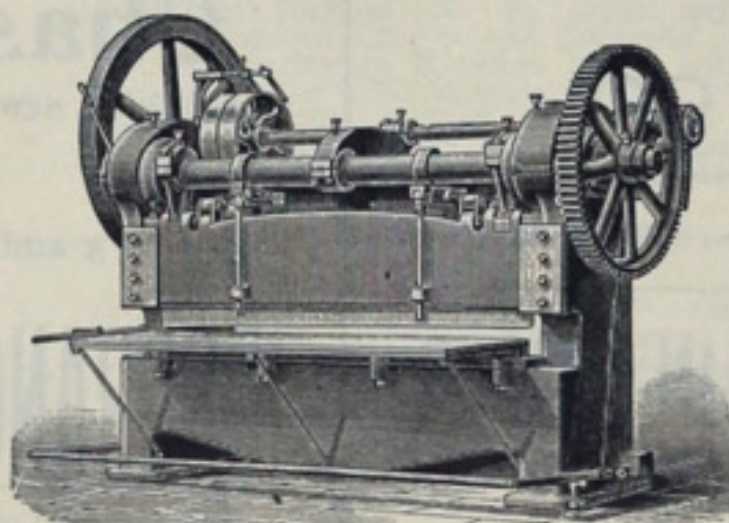
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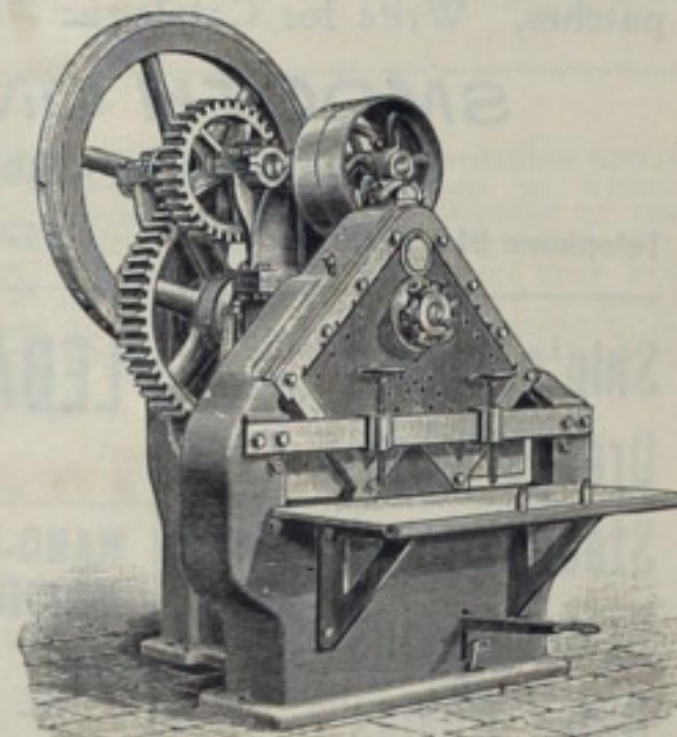
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Sizes.



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Take Ferry from foot of West 14th Street, N. Y

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FOR MAKING PERMANENT REPAIRS ON BOILERS OR PIPING.

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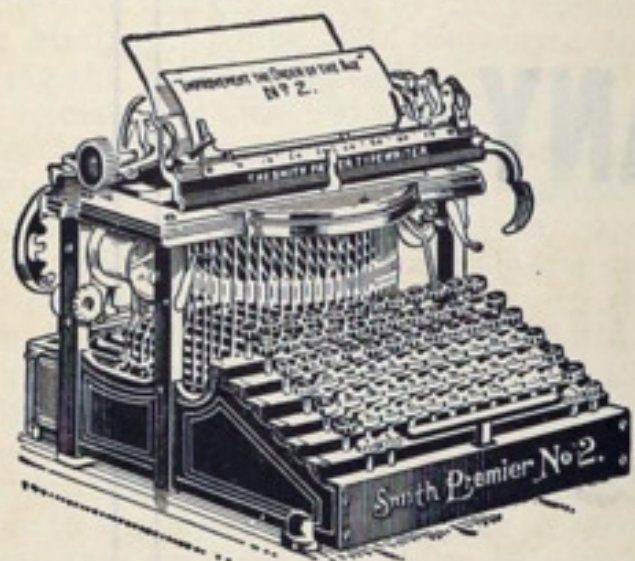
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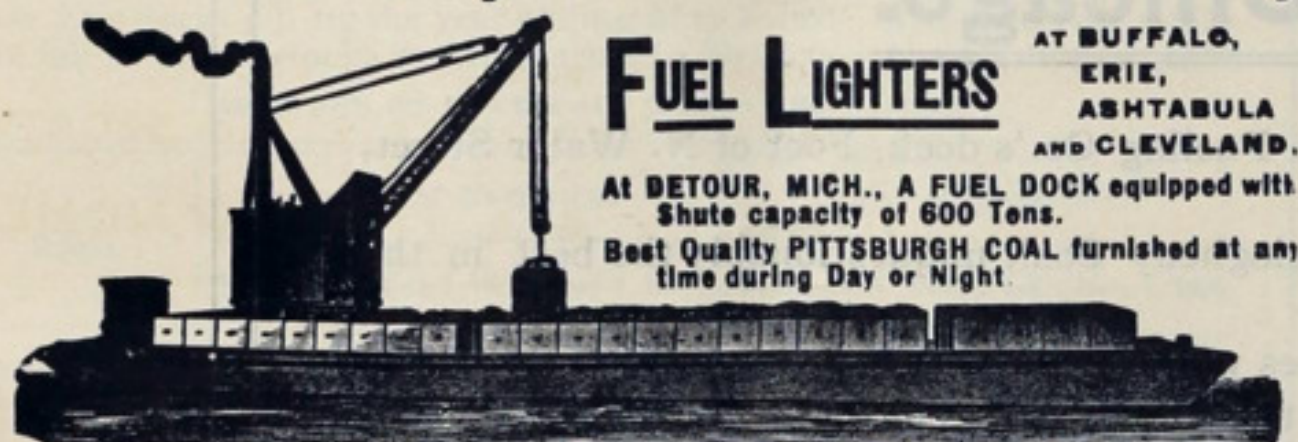
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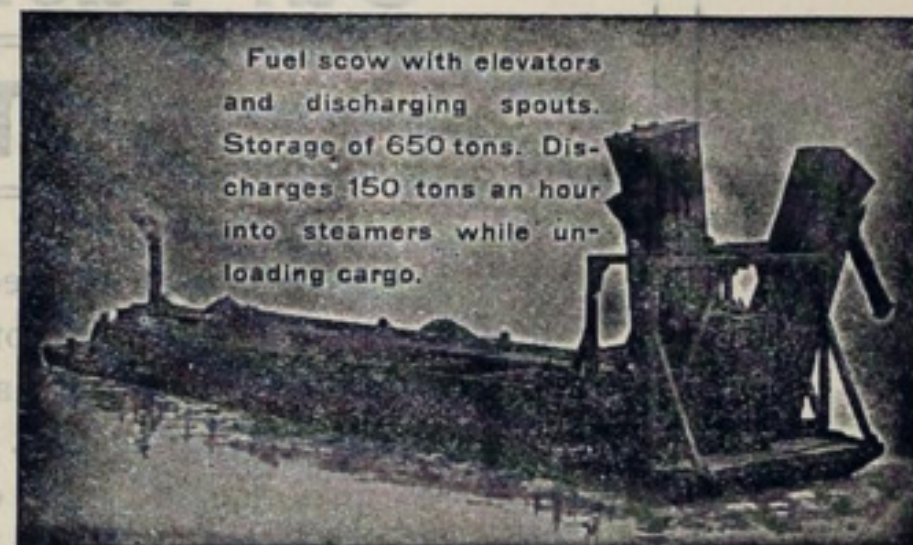
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UNITED STATES Engineer Office, 1637
Indiana Ave., Chicago, Ill., March
31, 1899. Sealed proposals for constructing
thirteen miles, or less, of Feeder of Illi-
nois and Mississippi Canal, from mile 17
to mile 29, south of Tampico, Ill., will be
received here until 12, noon, central time,
May 9, 1899, and then publicly opened. In-
formation furnished on application here,
or to Assistant Engineer L. L. Wheeler,
Sterling, Ill. W. L. Marshall, Maj. Engrs.
May 6.

U. S. Engineer Office, 185 Euclid Ave.,
Cleveland, O., April 15, 1899. Sealed pro-
posals for dredging channels, and for
constructing jetty and bar protection of
brush and stone at Sandusky Harbor,
Ohio, will be received here until 2
o'clock, p. m., central standard time,
May 15, 1899, and then publicly opened.
Information furnished on application.
Jared A. Smith, Col., Engrs. May 11.

PROPOSALS FOR DREDGES.—Missis-
sippi River Commission, Fullerton Build-
ing, St. Louis, Mo., April 19, 1899.—Sealed
proposals, in triplicate, for construction
and delivery of two self-propelling hydrau-
lic dredges complete with machinery, cab-
in, outfit, etc., will be received here until 12
o'clock noon, standard time, May 31, 1899,
and then publicly opened. Information
furnished on application. Mason M. Pat-
rick, Capt., Engrs, Sec'y. May 25.

U. S. Engineer Office, 1637 Indiana Ave.,
Chicago, Ill., April 25, 1899. Sealed pro-
posals for dredging in Calumet River will
be received until noon (central time) May
25, 1899, and then publicly opened. Infor-
mation furnished on application. W. L.
Marshall, Maj., Engrs. May 18.

U. S. Engineer Office, D. S. Morgan
Building, Buffalo, N. Y., April 1, 1899.
Sealed proposals for hire of dredging plant
for excavation in Niagara River will be
received here until 11 o'clock a. m., May
20, 1899, and then opened. Information fur-
nished on application. T. W. Symons,
Major, Engrs. May 11.

U. S. Engineer Office, 57 Park St., Grand
Rapids, Mich., April 19, 1899. Sealed pro-
posals for repairing government pier at
Saint Joseph, Mich., will be received here
until 3 p. m., May 19, 1899, and then publicly
opened. Information furnished on ap-
plication. Chester Harding, Capt., Engrs.
May 11.

U. S. Engineer Office, Milwaukee, Wis.,
April 10, 1899. Sealed proposals for dredg-
ing at: Menominee River, Oconto, Green
Bay, Two Rivers, and Milwaukee harbors,
will be received here until 12 o'clock noon,
standard time, May 17, 1899, and then publicly
opened. Information furnished on ap-
plication. J. G. Warren, Capt., Engrs.
May 11.

U. S. Engineer Office, Milwaukee, Wis.,
April 20, 1899. Sealed proposals for Har-
bor of Refuge Milwaukee Bay, Wis.,
breakwater construction; Racine Harbor,
Wis., crib pier, breakwater, removal of old
pier, and dredging; Kenosha Harbor,
Wis., pile and crib piers, crib breakwater,
removal of old pier, and dredging; will
be received here until 12 o'clock noon,
standard time, May 25, 1899, and then publicly
opened. Information furnished on
application. J. G. Warren, Capt., Engrs.
May 18.

SEALED proposals for furnishing about
twenty-four thousand tons of armor
for naval vessels will be received at the
Navy Department until 12 o'clock, noon,
Wednesday, May 31, 1899, when they will
be publicly opened. Forms of proposal
and all information may be obtained from
the Chief of the Bureau of Ordnance,
Navy Department, Washington, D. C.
Chas. H. Allen, Acting Secretary.
3-29-99—May 11

U. S. Engineer Office, D. S. Morgan
Building, Buffalo, N. Y., March 29,
1899. Sealed proposals for Construction of
Concrete Superstructure on Breakwater
at Buffalo Harbor, N. Y., will be received
here until 11 o'clock A. M., May 10, 1899,
and then opened. Information furnished
on application. T. W. SYMONS, Major
Engrs. May 4



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